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NOTES ON THE FLORA OF SOUTHERN FLORIDA.

BY FREDERICK BRENDEL.

Is the flora of Southern Florida and the Keys in reality North American or West Indian? One of the greatest authorities in botanical geography, Prof. Grisebach, in his latest work upon the distribution of plants ("Vegetation der Erde," 2, p. 340), as also in a previous one ("Die Geographische Verbreitung der Pflanzen West Indiens," pp. 19 and 20), favors the former opinion.

He says:—"The character of the vegetation of Florida is in general identical with that of Georgia and Carolina. But eight species of West Indian woody plants occur in Florida, and but six in Key West.* When the Northern Bahamas above 27° N. Latitude shall be explored it is probable that the difference between them and the neighboring main-land, but sixty-five English miles distant, will be yet more evident. This difference is not due to climate, nor yet to geological structure, for as the coast of Florida is surrounded by coral reefs, so has the archipelago of the Bahamas been built up by the same means. Why is it then that the vegetation of the West Indies has possession of these islands and not of the equally near and similarly formed Keys of Florida? Even the few plants which are common to both occur also for the most

*In Florida, two *Coccolobæ*, *Pithecolobium Unguiscati*, *Guettardia elliptica*, *Psychobria lanceolata*, *Myrsine læta*, *Jacquinia armillaris* and *Tournefortia gnapalodes*; in Key West, *Guaiacum sanctum*, *Schœfferia frutescens*, *Passiflora angustifolia*, *Exostemma Caribæum*, *Erithalis fruticosa* and *Beurreria tomentosa*.

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part on the continental coast of the Gulf, and may as probably have reached the Keys from there as from Cuba. The most obvious reason is found in the fact that the Bahamas are united with the Greater Antilles by innumerable islands and shoals, while on the contrary Florida and the Keys are separated from them by the Gulf Stream—a proof that ocean currents do not always serve to connect floral regions but at times aid in preserving the limits between creations originally distinct." Now to these suggestions some objections may be made. When we see the habitat of many hundred of species indicated in the books by the phrases "New England to Florida," "S. Carolina to Florida," etc., it seems evident that the flora of Florida belongs to that of North America. But "Florida" in most of these cases means Northern Florida. Southern Florida, from Tampa Bay southward, has been explored only at solitary points upon the coast by a few botanists, who have taken notice only of the more conspicuous and chiefly woody plants. It is not improbable that when the vegetation of this region is better known it will prove to be not so different from that of the Northern Bahamas as Prof. Grisebach now supposes.

Geological causes cannot be excluded in botanico-geographical investigations where recent causes are insufficient to explain facts. The coral formation of Southern Florida—if it be true that the polyps cannot live but in a certain depth of water—indicates a slow subsidence of the land, and this movement may possibly have preceded the upraising of the tertiary Atlantic and Gulf coast of the Southern States and the existence of the Gulf Stream. Between Bemini Point and Cape Florida the depth of the stream is considerably less than at any other point, and this may have been the line of connection between Florida and a tropical territory eastward, of which the Bahamas are the remnants. It is no more probable that the "few" woody plants enumerated by Grisebach have immigrated across the channel or made the long circuit of the shores of the Gulf, than that they are the residue of a once larger number of plants common to Florida and the Bahamas.

But is the number of these plants indeed so small? Dr. Chapman enumerates in his "Flora of the Southern States" no less than 231 species which do not extend northward of Tampa Bay. To these 16 may be added from other sources,* making 247 species

*From DeCandolle's Prodromus, *Hyptis spicata*, *Croton humilis* and *linearis*, *Argyrothamnia Fendleri*, and *Zamia Floridana* and *pumila*; from Bot. Mex. Bound. Survey,

(136 woody, 83 perennial, and 28 monocarpic), of which 187 are common to the West Indian Islands and partly to South America and (31) to Mexico. 23 to Mexico only, and 37 known as yet only from Southern Florida.

If it be conceded that the Gulf Stream is an insurmountable obstacle to immediate immigration from the West Indies, and that any plant from there must have made the circuit of the Gulf, why is it that the majority of these emigrants have not settled in Mexico, as should have been expected from the greater chances that evidently exist in favor of that country. The inference is reasonable that the 156 species of Southern Florida which are common only to regions lying southward and not to Mexico have for the most part not been transmitted by the waters of the Gulf, and that we must recur to other than the recent means of migration.

The flora of Northern Florida, including 58 widely distributed species which are not expressly noted by Chapman as growing there, comprises 1511 species of vascular plants, of which 875 occur in the Northern States. Of the remainder 234 extend to North Carolina, 113 to South Carolina, 108 to Georgia, 3 to Tennessee, and 53 only westward. Of all these only 15 are mentioned expressly as occurring in Southern Florida. Of the 125 which are known only from Florida 9 have been found in the southern part of the State. There are 1487 Floridan species which are not known as belonging to Southern Florida, or which at least are not so reported in published documents.

It may further be remarked that the above 247 southern species belong to 170 genera, of which 102 with 131 species are not represented in Northern Florida, and of these again 26 genera with 30 species belong to orders which are not found in other parts of the eastern United States. Comparing, moreover, the woody, perennial and monocarpic species, we find the numbers quite disproportionate and must suspect that a great number of perennials, particularly Cyperaceæ and grasses in the interior are unknown.

From all these facts we conclude that the flora of Southern Florida is, so far as known, not to be considered a part of the

Heliotropium polystachyum and *Sarcostemma clausum*; from Nuttall's Sylva, *Acacia latisiliqua*, *Sideroxylon fœtidissimum*, *Cordia speciosa* and *floribunda*, and *Coccoloba parvifolia*; and from Grisebach. *Abutilon permolle*, *Desmodium tortuosum* and *Crinum Floridanum (?)*.

North American flora, but a link between it and that of the West Indies, and that a portion of those species which are peculiar to the northern portions of the State, and the immediately adjacent region, may have been derived from the south.

THE CLASSIFICATION OF THE RHYNCHOPHOROUS COLEOPTERA.

BY JOHN L. LECONTE, M.D.

OTIORHYNCHIDÆ.

In a large number of genera* of Rhynchophora, at the front part of the mandibles, may be seen a round or oval depression, having the appearance of a scar, and which served, during the pupa stage, and for the early part of the imago life, as an attachment for a deciduous piece, of a conical and usually slender form. Many times specimens had occurred in which one or both of these pieces were still adherent, and the explanations thereof were varied and incorrect.† The opinion of Lacordaire seems to be quite satisfactory, that they are probably of service in enabling the insect to cut its way out from the nest or cell in which the transformation takes place.

While recognizing the frequent occurrence of this singular structure, altogether without parallel among other insects, it does not seem to have occurred to Lacordaire, that we have here a character of great importance for systematic purpose, and that after removing the large mass of such genera, the normal series of Curculionidæ would be much more amenable to classification. In fact I think it may be shown that the confusion and indefiniteness of the first part of the classification of Lacordaire is mainly owing to the intercalation of genera with scarred mandibles and those with simple mandibles. I have therefore placed the former as a separate family, having the following general characters.

The body affects two forms; in the apterous species the elytra are connate and convex with the humeri rounded; in the winged species they are more oblong, with the humeri more or less prom-

* Lacordaire, Gen. Col. vi, 5 (note).

† Müller, Germar's Mag. iii, 424.

inent. The beak is alike in both sexes, usually short and broad, sometimes longer and thickened or dilated at tip, which is emarginate; the antennal grooves are either (1) on the upper surface of the beak (Otiorhynchus), in which case they are short, and not bent downwards; (2) longer, lateral, and directed towards the eyes or (3) long or short, directed obliquely below the eyes; they always extend nearly to the apex. The mandibles are short and thick, pincer-shaped, with an apical scar, which varies somewhat in different genera, to which was attached a deciduous piece also of variable form; very long and falcate (Phyllobius, etc.), long and straight (Trigonoscuta), or short and obtuse. The mentum is large, and fills the buccal space, except in Eudiagogus, where it is small, leaving the maxillæ exposed. The antennæ are geniculate, with the scape usually very long; the club is pubescent and annulated. The eyes are usually rounded, but in several genera transverse and pointed below; in the latter case, but also in some of the round-eyed genera, the front margin of the prothorax is dilated forming post-ocular lobes; these lobes are sometimes very feeble and sometimes indicated only by a marginal row of long hairs (*vibrissæ* of Lacordaire). The front coxæ are contiguous in our genera. The trunk is short, even in the winged species, the epimera of the mesothorax project below the elytra to a greater or less extent; the episterna of the metathorax are either covered by the elytra, and indistinct, or narrow and very distinct. The hind coxæ are usually widely separated, the ventral segments are 5 (in one specimen of Nocheles but 4 are visible); the 1st and 2d larger, connate, 3d and 4th shorter, 5th a little longer. The lateral extension of the ventral segments is tolerably wide, broader behind; the dorsal segments are membranous, the last is corneous, divided in ♂ as usual, but the terminal portion apparently more retractile than in genuine Curculionidæ. The legs are moderate, tibiæ variable in form, tarsi spongy beneath, usually dilated, though sometimes (Ophryastes) very slightly so, and in Rhigopsis only sparsely ciliate.

The tribes of this family so far as represented in our fauna may be naturally grouped as follows:—

A. Side pieces of metathorax concealed, or indistinct; elytra connate: Antennal grooves short, on the upper face of the beak; or lateral and directed towards the eyes, eyes rounded, or nearly so, prothorax not lobed. . . . . OTIORHYNCHINI.

Antennal grooves lateral, directed below the eyes, which are rounded, prothorax not lobed: . . . . . BRACHYDERINI.
Directed below the eyes, which are sometimes transverse, prothorax more or less lobed:
Humeri rounded. . . . . LEPTOPSINI.
Humeri angulated. . . . . RHIGOPSINI.

B. Side pieces of metathorax narrow, distinct:
a. Elytra connate, humeri rounded:
Eyes rounded, prothorax not or scarcely lobed. DYSLOBINI.
Eyes transverse, prothorax lobed. . . . OPHRYASTINI.
b. Elytra free, humeri distinct, wings perfect;
I. Mentum large, beak short, flat;
Antennal grooves very short, not oblique (eyes usually rounded and prothorax not lobed); outer stria of elytra entire . . . . . PHYLLOBIINI.
Antennal grooves longer, oblique, outer stria of elytra imperfect. . . . . TANYMECINI.
II. Mentum large, beak rather long. . . EVOTINI.
III. Mentum small, gula prominent; beak short, antennal grooves oblique, deep; eyes transverse, prothorax lobed in front. . . . . EUDIAGOGINI.

It will be seen after a short inspection of the characters above mentioned for the definition of the respective tribes, that the general arrangement in this family parallels in a remarkable manner that which I have developed in the Tenebrionidæ,* and which has been adopted by Dr Horn in his excellent monograph of that family, as represented in our fauna.† There is, namely, a higher series, characterized by large mentum and absence of wings, distinguished in the former case (Asididæ) by the ventral segments entirely corneous,‡ in the latter (A) by the indistinct side pieces of the metathorax. Then comes a second series, composed of two principal subseries, Blapsidæ in the former instance, with elytra widely extended on the flanks, and Tenebrionidæ with narrow epipleuræ, the first always apterous, the second mostly winged; in the present family we have (B–a) apterous, and (B–b) winged, and in the last, as in the genuine Tenebrionidæ, additional degradational characters in the oral organs, which, in the isolated genus Eudiagogus, have the same general form as in the short beaked species of the next family.

It is also worthy of remark that while the European species are

* Class. Col. N. America.

† Trans. Am. Phil. Soc., xiv, 253, sqq.

‡ The only instance in the Tenebrionidæ of this character, occurring outside of the Asidide series, is in a small group, Calcar, etc., otherwise allied to Tenebrionini.

very numerous, the representation in North America is but small, and that the highest form, Otiorhynchus, exists on this continent only as a few species imported with and parasitic on fruit trees, in the Atlantic States.

On examining closely the part of the head adjacent to the eyes, a small oblique suture will be seen extending downwards from the anterior inferior part; if this fissure is entirely closed, the eye is round, as in the majority of the genera; if it is open the eye becomes more or less pointed at that part, and finally assumes the transverse, acuminate form observed in Ophryastes, etc. My attention was first directed to this peculiarity, by observing that in the few species of Otiorhynchus now domiciled in the United States, there are quite perceptible differences in the form of the eyes, which are more rounded in *O. arcticus*, and more pointed in *O. ligneus*. In Agraphus this fissure is more distinct, and the eye is accordingly more pointed.

The groups of Otiorhynchini are distinguished by the tarsal ungues and antennæ, as follows:

Ungues separate;
  Antennæ long and slender, ... Otiorhynchi.
  Antennæ thicker, ... Trachyphloei.
Ungues connate at base, ... Periteli.

The tribe Brachyderini as here limited is by no means that defined by Lacordaire under the same name. I have removed from it various groups having the humeri distinct, which will be found below and under Tanymecini; Sitones and its allies do not even belong to this family, but will be found among the first Curculionidæ, where the simple mandibles and small mentum entitle them to be placed.

Thus diminished, the tribe, as represented in our fauna, indicates but two groups, distinguished by the form of the beak:

Beak longer than the head, feebly auriculate, antennal grooves commencing on the upper surface; support of deciduous piece very prominent, eyes coarsely granulated, somewhat pointed below. AMOMPHI.

Beak scarcely longer than the head, not auriculate, support of deciduous piece very prominent; eyes finely granulated, subemarginate in front . . . . . GEONOMI.

The first group is represented by a single undescribed species from Colorado; the accessory mandibular pieces are short, pyramidal, obtuse, and slightly curved.

The second group is represented by two species on the Atlantic slope, belonging to Epicaerus and Graphorinus; the body is pyriform and robust; the accessory mandibular pieces are not preserved in any of my specimens, but the process which supports them is longer and more prominent than in any other group.

With the tribe Leptopsini, and the anomalous Rhigopsis described below, the series having the side pieces of the metathorax indistinct or invisible is concluded. They differ essentially by the outline of the front margin of the prothorax being sinuous when viewed laterally, so as to form a broad lobe for the protection of the eyes, when the head is deflexed; and correlative with this the tip of the prosternum is broadly and feebly emarginate. The eyes are more or less transverse and pointed below, though nearly round in Phyxelis. The beak is moderate or rather long, sometimes wider at tip, and auriculate (*Hylobius? torpidus* Lec. and *Tyloderes? gemmatus* Lec.,) very much as in Otiorhynchus. The antennal grooves are visible from above, but descend obliquely, towards the inferior angle of the eye, which however they do not reach. Panscopus and Phyxelis represent this tribe in the Atlantic States, and also a species which I refer to Strangaliodes; the Pacific representatives are the two species above named, each indicating a new genus. I have a remarkable ♀ specimen of *H.? torpidus*, having but 4 ventral segments, one of the two short segments being wanting.

The second great division of the Otiorhynchidæ, in which the side pieces of the metasternum are well defined, though always narrow, may be separated into two principal types, according to the form of the beak.

In the first, the beak is moderate, or rather long, more or less thickened, with the antennal grooves (as in all the preceding), somewhat visible from above, and either directed towards the eyes, or obliquely downwards; the prothorax is truncate at base, the elytra are connate, and the humeri are rounded. The eyes vary in form, and the prothorax is either lobed or not, according as the eyes are transverse or rounded.

Apical process of mandibles pyramidal, acute:
  Tibiæ with a terminal hook, ... Dyslobi.
Apical process not prominent:
  Tibiæ normal, truncate at tip, ... Ophryastes.
  Tibiæ expanded at tip,. . . . . Trigonoscutæ.

In the second type the beak is flat above, usually channelled,

sometimes finely carinate, not expanded at tip; the antennal grooves are very narrow, parallel at their origin, and usually suddenly deflexed, though sometimes (Phyllobius) very short and straight. The eyes vary in form and the prothorax is lobed or not. The prothorax is usually bisinuate at base, with the hind angles acute, though sometimes truncate. The elytra are usually free, with prominent humeri, and the wings well developed: though sometimes they are connate, with rounded shoulders. The accessory mandibular piece is long and falcate in both, and the support at the tip of the mandible is circular and not prominent; characters of great moment when associated with the peculiar form of body.

Two tribes are indicated by a difference in the outer stria of the elytra:

Outer stria of elytra entire.	PHYLLOBIINI.
Outer stria of elytra abbreviated or interrupted . .	TANYMECINI.

The first tribe is represented by Pachnæus, and Phyllobius in the Atlantic States, and by Scythropus on both slopes of the continent. Of these Pachnæus has the eyes transverse, and the prothorax lobed at the sides in front, while in the others the eyes are rounded, and prominent, and the front outline of the prothorax is straight. The species are all winged, and the humeral angles are obtuse and well defined. The base of the prothorax is truncate in all the genera except Pachnæus, where it is distinctly bisinuate.

Macrostylus, a Brazilian genus recently found in Texas, is an anomalous member of this tribe. The antennæ are very long and slender, and the joints of the club seem to be quite separate and free. It is of very small size, and has the elytra connate and the humeral angles not prominent; the beak is not channelled, but otherwise resembles the beak of other members of the tribe. The claws are connate almost to the tip, as in Phyllobius, etc., while they are separate in Pachnæus. There are thus three groups indicated.

Prothorax lobed in front; claws separate:	Pachnæi.
Prothorax not lobed; claws connate:	
Humeri prominent, elytra free:	Phyllobii.
Humeri not prominent, elytra connate: . . .	Macrostyles.

The Tanymecini resemble in form the Phyllobiini, but are readily distinguished by the outermost stria of the elytra being confluent

with the next about $\frac{1}{3}$ from the base, or abbreviated at that point, or interrupted, the continuation commencing behind the middle and extending to the tip. The prothorax is bisinuate at base (Compsa, Brachystylus and Brachythysus), truncate or feebly rounded in Tanymecus, Aphrastus, and the genera with connate elytra. The eyes are rounded and the prothorax not lobed in all of our genera.

Four groups are indicated in our fauna.

Elytra connate, humeri not prominent, ...	Symmathetes.
Elytra not connate, humeri angulated;	
Claws connate, ...	Aphrasti.
Claws separate;	
Prothorax truncate at base, ...	Tanymeci.
Prothorax bisinuate at base, ...	Cyphi.

Next to this tribe come the Entimini, large and brilliant insects of South America; the rostrum is stout, not so broad as in the last two tribes, deeply emarginate at tip, perpendicular on the sides, thickened below at the tip, with the antennal grooves deep and oblique; the apical scar of the mandibles is very large, circular and not prominent. The eyes are pointed below, and the prothoracic lobes large. The prothorax is comparatively small, and bisinuate at base; the elytra at base very broad, with prominent humeri, gradually narrowed and acute behind; the outermost stria is entire. The edge of the elytra and the ventral sutures are densely fringed with short hair; the claws are not connate.

Two insects presenting anomalous characters remain to be considered, each indicating a separate tribe.

The first is found abundantly in Oregon; the beak is two and a half times as long as the head, moderately slender, dilated and auriculate at tip, which is deeply emarginate; the grooves are visible from above, short, broad and deep, prolonged very indistinctly in an oblique direction; the apical scar of the mandibles is large and circular, but not prominent. The eyes are nearly round, and not prominent. The antennæ are slender, and not different in form from those of Otiorhynchus. The prothorax is rather small, a little narrowed in front, not lobed, truncate behind. Elytra wider at base than the prothorax, humeral angles obtuse distinct, feebly rounded at the sides, obliquely narrowed behind; scutellum distinct. First ventral segments feebly sinuate, the others straight; side pieces of metasternum distinct. Legs slen-

der, tibiæ feebly mucronate at tip; tarsi dilated, brush-like beneath, claws separate.

This species is from 10–11^{mm} ·4–·45 inch long, black, densely clothed with small cinereous scales, with lateral and dorsal vittæ of the prothorax, and scutellum pale yellow; the prothorax is sparsely punctured, and the elytra very feebly striate. I have named the genus Evotus. It is the *Otiorhynchus? naso* Lec. (Pac. R. R. Expl. and Surveys, p. 56).

The second of the anomalous forms above mentioned is a small, roughly tuberculate insect of the southern part of California, found under bark of yucca. It resembles in appearance the European Rhytirhinus, and shows unmistakable Byrsopide affinities. The mentum is, however, similar to that of the other Adelognaths of the present family, and the apical scar of the mandibles is distinct, flat and subtriangular, though without the central elevation usually seen. The tarsi are less dilated than usual, and sparsely ciliate beneath; the 3d joint is emarginate rather than bilobed, the claws separate. The rostrum is moderate in length, thick, irregular, not emarginate at tip, prominent above the eyes; the antennal grooves are deep and descend obliquely below the eyes which are pointed below, oblique and transverse. The scape of the antennæ extends nearly to the eyes; the funiculus is longer than the scape, 7-jointed as usual, with the 1st and 2d joints a little longer; club oval, pointed and annulated as usual. Prothorax strongly lobed behind the eyes, feebly emarginate beneath, broadly flattened (but not excavated) in front of the coxæ. The side pieces of the metathorax are *not distinct*, the 1st and 2d ventral segments are large, connate by a sinuated suture; 3d and 4th short, 5th longer than the 3d and 4th united, with a broad impression each side near the margin.

The species is of small size (5·5^{mm}) brown, covered with a dirt colored crust, very roughly reticulate above, with large deep pits; the humeral angles are sharp and prominent; there is a large tubercle on each elytron about $\frac{1}{4}$ from the tip, and another smaller one near the tip. I have named this singular insect *Rhigopsis effracta*.

The last tribe having an apical scar to the mandibles is Eudiagogini, represented by two species in the southern Atlantic States. The form resembles somewhat the Tanymecini, but is rather stouter and more convex; the color is black adorned with narrow stripes and bands of metallic scales.

The beak is short and stout, channelled above, feebly emarginate at tip, with the antennal grooves narrow and deep, running obliquely below the eyes, which are transverse and pointed below. The mandibular scar is small and triangular, not prominent. I have not seen the deciduous piece, but suppose it to be small, short and pyramidal. The mentum is retracted leaving a deep cavity, from the hind margin of which projects the gula in a small emarginate prominence, much like the mentum-tooth in certain Carabidæ. The prothorax is broadly rounded at base, with the hind angles nearly rectangular; the postocular lobes are large, and the front margin of the prosternum is nearly squarely truncate, so as to make a rounded right angle with the outline of the postocular lobe. The front coxæ are contiguous, the side pieces of the metathorax narrow, distinct; the ventral segments 1st, 2d and 5th long, 3d and 4th short; 1st and 2d sutures feebly sinuate, but in reverse directions. Legs moderate, tibiæ with a small terminal spur at the inner side; tarsi with 3d joint broadly bilobed, claws approximate, but not connate.

A singularly isolated type, seeming to have no relations with any other in our fauna.

CURCULIONIDÆ.

After thus separating the families above defined, there remains a vast complex of genera having the sexual characters of this series, the antennæ geniculate (with rare exceptions), the club always oval pointed and annulated, uniformly pubescent; the mandibles without deciduous piece, usually 3-toothed at tip, which is perpendicular. The mentum is always small or moderate in size, not concealing the maxillæ, and inserted upon a more or less elongated gular peduncle. The beak varies in form, as will be pointed out under the respective tribes; the antennal grooves rarely extend to the front extremity of the beak (as in all the members of Otiorhynchidæ), but commence at a greater or less distance from the tip (except in Sitonini). The front coxæ are either contiguous or separated; the side pieces of the metathorax are always distinct: the pygidium is either covered by the elytra, or exposed.

The following principal divisions may be established:

A. Antennal grooves extending to the base of the mandibles, gular peduncle broad, not emarginate; (*Brachyrhynchi*).

Beak short, broad, gular margin not prominent, eyes round. SITONINI.
Beak short, very thick, buccal cavity deep. . . . . BATHYRINI.
Beak moderately long, gular margin prominent, peduncle and mentum retracted. . . . . ALOPHINI.

B. Antennal grooves not extending to the base of the mandibles;
A. Gular peduncle broad truncate, mandibles emarginate at tip (antennæ not geniculate, claws toothed); . . . . . ITHYCERINI.
B. Gular peduncle long: (*Mecorhynchi*).

A careful analysis of the tribes composing the last division (Mecorhynchi) would extend this memoir to an unsuitable length for my present purpose, and must be reserved for the concluding part of my work on classification,* now in preparation. A few remarks upon the other four tribes, which might even be regarded as subfamilies, will however not be out of place. The types are well known with the exception of the second, Bathyrini, founded upon a very remarkable species from Arizona and Texas, which resembles somewhat a Cratoparis, of the family Anthribidæ; a resemblance increased by the hind angles of the prothorax in ♂ being expanded and flattened, so as to be as wide as the base of the elytra. The beak is not longer than the head, deeply constricted at base beneath, then suddenly expanded so as to be as broad as long, very thick, strongly channelled and deeply emarginate above. The antennal grooves are deep, extending to the base of the mandibles and flexed below the eyes, which are pointed below; the scape of the antennæ extends as far as the eye; the 1st joint of the funiculus is $\frac{1}{3}$ as long as the scape; the 2d is about $\frac{1}{2}$ as long as the 1st; the 3d–7th nearly equal in length, gradually a little thicker; club pubescent, oval, annulated as usual. The buccal cavity is very deep, and square. The gular peduncle is not visible, and the mentum small, narrow, and deep in the cavity; the mandibles are strong, their base very broad and transverse, the tip (so far as I can see) feebly emarginate. The prothorax is lobed behind the eyes, and the prosternum deeply, almost semicircularly, emarginate in front. The front coxæ are contiguous; the side pieces of the metasternum narrow; the sides of the elytra narrowly emarginate behind the humeri, scutellum transverse, wider behind; the sutures of the ventral segments are straight, and the segments less unequal than usual, the 3d and 4th

* Classification of the Coleoptera of N. America. Smithsonian Institution Miscell. Publications. 8vo.

together being longer than the others separately. The legs are short, the tibiæ truncate, feebly mucronate at tip, and with broad distinct *corbeilles;* the tarsi are broadly dilated, 3d joint deeply bilobed as usual; claws separate. I have named this genus Bathyris.

B. dispar; oblong oval, black, thickly covered with large dirty brown scales, varied on the elytra with patches of paler cinereous, and with scattered darker scales; of these the most conspicuous is a lateral transverse spot in front of the middle; a larger indistinct apical blotch is marked with an oblique brownish line; the stria are represented by ten rows of quadrate punctures; the outer one not abbreviated nor confluent; scutellum transverse, cinereous scaly. Length 4–6^{mm}

Arizona, Dr. Webb; Texas, Dr. Horn. The specimen from Arizona has the thorax at base as wide as the elytra, the hind angles being expanded, flattened and acute, with the side margin acute; the sides in front of the angles are straight and oblique.

Four specimens from Texas, which I considered as females, have the prothorax rounded on the sides, narrower in front, scarcely subsinuate at base, which is not as wide as the elytra, with the hind angles not prominent, but slightly rounded. The general form is therefore as in Eudiagogus. I have seen a nearly allied species from the Argentine Republic.

The Sitonini contain small species greatly resembling in form Tanymecus of the family Otiorhynchidæ, but differing entirely by the mentum being small, and the maxillæ exposed; the gular peduncle is short and broad, but quite distinct, and is truncate at the front margin. The mandibles are emarginate at tip, and have no apical scar for the attachment of the deciduous piece which is characteristic of the preceding family. The beak is short, broad, flat and channelled above, emarginate at tip; the antennal grooves extend to the base of the mandibles; they are deep and well defined, and flexed obliquely downwards below the eyes; the eyes are rounded; the front margin of the prothorax is not lobed, and not emarginate beneath. The front coxæ are contiguous, the side pieces of the metathorax are narrow and separate; the ventral segments less unequal than usual, the suture between the 1st and 2d sinuated. The tibiæ are truncate at tip, the tarsi dilated and brushlike beneath, the claws separate and simple. The elytra at base are much wider than the prothorax, with the humeri oblique and prominent; wings developed in all of our species.

The tribe Alophini retains a remnant of a form seen otherwise only in the preceding family; the elytra are convex, with the humeri not prominent and the prothorax is comparatively small. The prominence of the gular margin easily distinguishes it from all other tribes. The tibiæ are slightly mucronate at the inner angle of the tip, and the terminal surface is well defined, not lateral. The apical margin of the mandibles is curved, sharp and prominent, thus making the outer face broad and flat, with a well defined margin. *Liophlœus inquinatus* Mann, from Alaska, belongs to this tribe, and seems scarcely different from Alophus, except by the shorter and stouter funiculus. *Lepidophorus lineaticollis* on the other hand has an entirely different oral structure, and is apparently allied to Phytonomus, etc.

Ithycerus is a completely isolated form, having no relation with other genera. As pointed out by Dr. Horn,* the remark of Prof. Lacordaire, that the ♂ has 6 ventral segments, is an erroneous interpretation of the very convex last dorsal segment, which can be seen from beneath.

BRENTHIDÆ.

The species of this family are remarkable for the very elongate form, and by the great sexual differences which sometimes occur in the mouth organs. In our own *Eupsalis minuta* for instance, the beak of the male is broad, short and flat, with large prominent mandibles, while in the female the beak is long and slender, with very small mandibles. But two genera occur in our fauna; Eupsalis on the Atlantic slope from Canada to Texas, and Brenthus in Lower California.

The mouth is not constructed on the same plan as that of the long beaked Curculionidæ; the gular peduncle is wanting, and the mentum varies in form according to the shape of the buccal opening, which it nearly fills, thus concealing the maxillæ. The family is also easily known by the antennæ being 11-jointed, not clavate nor geniculate, nearly moniliform in Eupsalis, somewhat compressed and broader externally in Brenthus.

The eyes are rounded, the lenses are covered with a perfectly smooth membrane, and are consequently not granulated, the front coxæ are separated by the prosternum; the metasternum is long, and the side pieces are distinct and very narrow. The 1st and 2d

* Proc. Am. Phil. Soc. 1873, 447.

ventral segments are very long, and closely connate; 3d and 4th short, 5th as long as the two preceding united. The tibiæ are truncate at tip, the front ones feebly unguiculate, and with the inner margin of the tip concave; tarsi dilated, brushlike beneath, 3d joint bilobed in our genera, 4th joint long, claws simple separate; the tarsi are less dilated in some exotic genera.

The dorsal segments are arranged exactly as in true Curculionidæ; they are all membranous except the last, which is corneous and convex in ♀, divided in ♂: the sides of the ventral segments are only narrowly prolonged upwards, and are imbricated; the last spiracle is large and uncovered. The elytra have on the inner side the usual lateral fold, but instead of becoming obsolete near the tip, it diverges strongly from the margin and is continued quite to the suture, fitting to the lateral edge of the last ventral segments, thus showing an approach to the peculiar modification afterwards seen in Scolytidæ.

Some of the most curious characters in the Rhynchophorous series occur in this family. Among them I may instance *Taphroderus distortus* Westwood, from Natal, remarkable by the enormous development of the left mandible; and *Calodromus Mellyi* Guerin, from India, in which the 1st joint of the hind tarsi is as long as the whole body.

Series III. HETEROGASTRA.

I have named this series from the fact, that although the abdominal segments are alike in both sexes, and the ventrals also prolonged upwards at the sides, fitting into a groove on the inner face of the elytra, as in the Allogastrous series, yet the best characters for the separation of the families are to be found in the particular modification of the arrangement of the last ventral segments.

Nothing distinctive can be predicated of the series as a whole, except the similar pygidium in both sexes, and the prolongation upwards of the ventral segments to fit in the elytral groove.

The families may be thus distinguished:

A. Pygidium vertical or declivous:
  a. Antennæ geniculate, clubbed; labrum wanting:
    Last spiracle covered etc. (sub-families etc.) . CALANDRIDÆ.
  b. Antennæ straight; labrum distinct:
    Last spiracle not covered by ventral segments; pygidium deeply notched to receive sutural apex of elytra. . . ANTHRIBIDÆ.

B. Pygidium horizontal; smaller:
  a. Antennæ geniculate, clubbed:
    Terminal edge of last ventral acute, surrounding the last dorsal; tibiæ generally compressed and serrate. . . SCOLYTID.E.
  b. Antennæ straight:
    Ventral segments very unequal, antennæ with annulated club. APIONID.E.
    Ventral segments nearly equal; antennæ with 11 separate joints. BELID.E.

CALANDRIDÆ.

Elytra with the usual fold on the inner face near the side very strongly developed; diverging behind, and becoming gradually effaced.

Ventral segments 3d and 4th shorter, 1st and 2d connate; lateral prolongations broad, imbricated; the sharp edge for reception in the elytral groove only developed on the 1st and 2d segments. Dorsal segments coriaceous, pygidium large, triangular, rounded at tip, declivous, alike in both sexes, though smaller in the third sub-family; last spiracle covered by prolongation of ventral segments.

An excellent synopsis of the United States species of this family has been published by Dr. G. H. Horn.*

According to differences in the form of the mouth, the indigenous genera may be divided as follows:

A. Pygidium exposed:
  Gular peduncle long, ... CALANDRID.E.
B. Pygidium covered by elytra:
  Gular peduncle broad, mentum concealed, . . . RHINID.E.
  Gular peduncle moderate, mouth normal, ... COSSONID.E.

The mouth in this sub-family is formed upon a peculiar type not seen in the genuine Curculionidæ: the gular peduncle is extremely long and narrow, leaving the maxillæ visible in the buccal fissures; the mentum is small, sometimes concave, and the palpi not usually visible. The mandibles are convex on their outer face and strongly toothed at tip as in many Curculionidæ. The beak is long, curved and cylindrical, the antennæ inserted at a distance from the mouth, geniculate, with a large club which is corneous and smooth at base, spongy and pubescent over the rest of the surface. The eyes are transverse and finely granulated. The

*Proc. Am. Phil. Society, 1873.

front coxæ are widely distant. The side pieces of the metasternum are large, and those of mesosternum also large, ascending obliquely. The hind coxæ are oval, and widely separated, the tibiæ are slender, sinuate, strongly unguiculate at tip, with the articular surface lateral; tarsi usually dilated, and brushlike beneath, sometimes narrow and not scopiferous; last joint rather long, claws simple, separate.

Rhinidæ.

Again a different modification of mouth is seen in this sub-family. The gular peduncle becomes a broad short plate projecting forwards, forming the floor of the mouth, within which the mentum is concealed. The mandibles are smooth and very convex on the inner face, while the outer face is rough and flattened, and the teeth project outwards. The beak is long and slender. The antennæ are geniculate, the club is smooth and corneous at base, spongy and pubescent for the rest of the surface. The eyes are large and coarsely granulated, and meet on the under surface of the head. The front coxæ are very narrowly separated, the under surface of the body, and the dorsal segments are as in Calandridæ, except that the pygidium is covered by the elytra. Tibiæ slender, strongly hooked at tip, tarsi narrow, 3d joint bilobed, ciliate at the sides, not pubescent: 4th joint long, claws simple, separate.

A small black species of Rhina has been found by Mr. G. R. Crotch, in the trunks of Yucca in the Mohave Desert of California; otherwise the genus occurs generally in tropical America.

Cossonidæ.

With the same arrangement of abdominal segments above described, these insects have an oral structure similar to that of the Hylobiini in the true Curculionidæ. The gular peduncle is moderately long, the mentum distinct, and palpi large. The mandibles are normal in form, convex externally, toothed as usual at tip. The beak is moderate, or (Rhyncolus) short and stout. The eyes transverse, moderately finely granulated. The antennæ geniculate, rather stout, club oval annulated, pubescent. Front coxæ separate, tibiæ hooked at tip, tarsi narrow, 3d joint not dilated. Pygidium covered by the elytra, smaller than in the two preceding sub-families.

SCOLYTIDÆ.

The members of this family, which contains some of the most destructive enemies of forest trees, may be easily recognized by

the peculiar arrangement of the last ventral segment, which is prolonged upwards along the whole lateral and apical margin, so that the pygidium is confined entirely to the dorsal surface, and, as it were, surrounded by this sharp edge.

The mouth is normal in form, the gular peduncle emarginate, the mentum moderate in size, prominent, buccal fissures broad, maxillæ exposed. Mandibles stout, curved, convex on the outer face, toothed on the inner side. Beak short, or almost wanting, antennæ short, geniculate, club usually solid, annulated on one or both sides, base usually smooth and corneous for a greater or less extent; rarely (Phlœotribus) the club is lamellated. Eyes usually large and transverse.

Front coxæ usually contiguous and subconical, hind coxæ large, not widely separated; tibiæ compressed, usually serrate on the outer edge, terminal spur large; tarsi sub-pentamerous, not spongy beneath, 3d joint sometimes narrow, sometimes dilated; 4th joint usually rudimentary, sometimes (Platypus) quite distinct, last joint long, claws simple, separate, strong.

The ventral segments are not very unequal in length, and the suture between the 1st and 2d is straight and well marked, the 5th is frequently the longest; the intercoxal process of the 1st is usually acute.

The dorsal segments are membranous, the pygidium is small and horizontal, covered by the elytra: the last spiracle is visible; the lateral upward prolongations of the ventral segments are well marked, and furnished with a sharp edge, continued even to the tip of the 5th segment. The lateral fold of the elytra is consequently well marked, the groove narrow and deep, gradually obliterated, but not wider toward the tip.

Two sub-families are indicated, Platypodidæ and Scolytidæ, the 1st with the basal joint of the tarsi very long, and the 4th distinct; the latter with the 1st joint shorter than the others united, and the 4th joint less developed.*

The synonymy of our species will probably present much difficulty, and the number is by no means that indicated by the names

* On p. 369, of vol. vii of the Genera des Coléoptères, Lacordaire has established a tribe Eutomides, which differs from all the others in having the flanks of the prothorax separate from the pronotum by a distinct edge; and the mass of the antennæ composed of 7 lamellate joints. These characters are so foreign to the Rhynchophora, that I cannot help suspecting that these insects have been misplaced. I sought for specimens in all of the large European collections which I visited, but without success.

in the catalogues. The only connected series of descriptions is contained in the synopsis by Dr. Zimmermann, with an appendix by myself,* in which differential characters are given for the definition and distinction of each species. Many of the same have been described by Mr. Eichoff,† with diagnoses only, and no comparative or differential characters. For their identification, therefore, comparison of specimens will be necessary, or the completion of the promised monograph of the family from the hands of that author must be awaited.

ANTHRIBIDÆ.

In this family of the Rhynchophora there is as near an approach to the normal Coleoptera as is observed in Rhinomaceridæ, the first family herein defined.

The beak is short or moderate, depressed above, with the antennæ inserted in foveæ or short grooves which are usually lateral, rarely (Choragus, etc.) on the upper face; the antennæ are not geniculate, with 11 distinct joints, rarely (Hormiscus) but 10: the scape is not elongated. The labrum is quite distinct; the mouth is normal in structure, the gular peduncle large and deeply emarginate, with the mentum and ligula received in the emargination, the maxillæ are exposed and have two distinct lobes, a character unknown in the preceding families, except in some Platypodidæ; mandibles flattened, curved and acute at tip, toothed on the inner side. Eyes large, rather finely granulated, rounded or emarginate. The front coxæ are contiguous or narrowly separated, rounded; the pronotum is sharply margined behind, and the margin is frequently distant from the base, curved forwards at the sides. The side pieces of the metasternum are distinct. The ventral segments are nearly equal, and rather closely connected, except the 5th which is free: the lateral prolongations are rather wide, *not imbricated*, and the sharp edge is well marked. The dorsal segments are membranous, except the pygidium which is rather large, deflexed and only partly covered by the elytra; the last spiracle is large and visible when the elytron is raised; the base of the pygidium is very deeply notched (so that the uncovered part appears slightly emarginate), and the sutural edge of the elytra (which is grooved for its whole extent) is bent down

* Trans. Am. Ent. Soc., ii, 141, Sept., 1868.
† Berliner Ent. Zeitschrift, 1868 et sqq.

and slightly prolonged at tip so as to fit into this excavation. The lateral fold of the inner surface of the elytra is well marked for the middle third, but is distant from the side, and gradually obliterated behind, following along the 2d line of punctures from the side. The tibiæ are slender, truncate at tip, with feebly developed spurs, never mucronate; the tarsi are dilated and brush-like beneath, the 2d joint usually deeply emarginate, receiving the 3d joint in the emargination: the 3d is usually narrower and shorter than the 2d and also emarginate: the last joint moderate in length, claws separate toothed.

As observed by Lacordaire,* when the sexual differences are well marked the male is larger than the female, and the beak of the latter is shorter: the reverse being the case in all other families of Rhynchophora. There are also sometimes great differences in the antennæ and front legs which are much longer in the male.

The larvæ of some species of Brachytarsus (*Anthribus* Geoff.) are parasitic on certain species of Coccus: the only example thus far ascertained of carnivorous habits among the Rhynchophora.

APIONIDÆ.

In this family the last dorsal segment is horizontal and small as in the Scolytidæ, but the other characters are quite different.

The beak is long and slender, the mouth small, the gular peduncle rather narrow and emarginate, the mandibles feeble, and acute. The antennæ are not geniculate, the scape is somewhat elongated; they are inserted on the side of the beak at or above the middle, and the grooves are very short; the eyes are rounded, rather coarsely granulated.

The prothorax is not lobed in front, the coxæ are contiguous, conical and prominent. The side pieces of the metathorax are distinct, narrow. The tibiæ are slender, truncate at tip; hind pair without spurs; the claws are separate, more or less toothed at the base.

The dorsal segments are membranous: the last segment (pygidium) is horizontal, rather small and corneous, entirely covered by the elytra; at the side it meets only the 5th ventral, and the last spiracle is not apparent: the ventral segments are very unequal,

* *l. c.* vii. 480.

the 1st and 2d very large connate, 3d and 4th very short, sutures straight: lateral prolongation very narrow: groove on the inner side of elytra narrow, gradually broader behind, fold extending nearly to the suture (somewhat as in Brenthidæ).

This family is represented by Apion, a genus containing a large number of small species of pyriform body, and altogether peculiar and of easily recognized appearance. So far as I have examined them they have well developed wings, though Lacordaire mentions that the body is apterous. This family is related to the Erirhine tribe of true Curculionidæ.

BELIDÆ.

The Australian genus Belus, and the South American Homalocerus, on examination present so many differences that I have separated them to form a new family, which must be placed in the present series. In fact, with a form of body greatly resembling Lixus of the true Curculionidæ, they have the dorsal abdominal segments of Apion; the ventral segments are, however, equal or nearly so; the lateral prolongation is very narrow, and although the edge is acute, the lateral fold on the inner face of the elytra extends only in the middle third, and is nearly confluent with the margin at its front end. The antennæ are slender, 11-jointed, straight, and the scape is moderately long. The tibiæ are slender, truncate at tip, and the hind pair have two small but distinct spurs as in normal Coleoptera.

In the ♂ of Belus the apex of the elytra is prolonged as in many species of Lixus; and this family seems related to the Cleonine tribe of Curculionidæ as Apion is to the Erirhine. A slight trace of epipleura may be observed at the front part of the elytral side margin, thus showing also a relationship with the Rhynchitidæ of the first series, in which, as I have above mentioned there is a feeble fold on the inner face of the elytra about the middle, but quite distant from the margin.— *Concluded.*

HERBARIUM CASES.

BY DR. C. C. PARRY.

NOTWITHSTANDING the lucidly expressed opinion of the present official authority in Washington, dignified with the high sounding title of the Honorable Commissioner of Agriculture, or the "unimportance of the routine duties of the herbarium botanist," there has probably never been a time in the history of scientific botany, when greater attention has been given to this very important subject.

More especially is this true of a rapidly increasing class of local or amateur "herbarium botanists," who are intent on the collection and preservation for convenient reference and study, of limited floras, or particular natural orders of plants.

Having had occasion from a somewhat prolonged experience as a botanical collector, to realize the want in my own case as well as to observe the frequent loss of valuable material by others, from the lack of suitable herbarium appliances, I have been led to adopt a simple contrivance with a view to meet the *desideratum*.

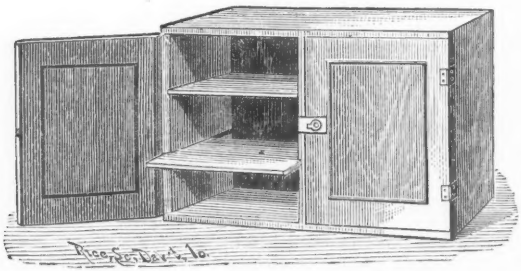
While for very extensive and permanently located herbaria, such as that of Prof. Gray at Harvard, stationary cases are perhaps more desirable on the score of economy; still there is a manifest advantage in having a somewhat portable character to such depositories, in order that necessary additions can be incorporated into the general collection with least disturbance of the original arrangement. More especially in the much larger class of collections subject to removal, is it advisable to provide for such contingencies, by separate portable cases.

Still another advantage of such an arrangement is in limiting the depredation of destructive insects within narrow limits, where they can be checked without the great expense of going over an entire collection. In this view, (somewhat on the plan adopted in the British museum), I have adopted cases of the following description.

These cases consist essentially of an evenly partitioned box, with double doors, black walnut (or hard wood) fronts, finished

flush on the outside, with no irregular projections of knobs or catches, so that for distant transportation they can be snugly enclosed in rough outside boxes (two or more together). The inside in each apartment has a capacity of 18½ inches in height, by 13½ inches in breadth, and 18½ inches in depth. Each space is divided by two movable slides, into three equal divisions, or six to each case. The doors are bevelled on the inside, with a corresponding bevel on the case, to which they are attached by outside hinges, so that in opening at a right angle there are no sharp edges to hinder the drawing out of the herbarium papers;

Fig. 83.



as well as allowing the cases to stand close side by side, without interfering with the free opening of the doors, which can swing clear back against the sides without bringing any strain upon the hinges. In packing for removal, remove the papers and slides, turn the cases on their backs, and lay in the papers in regular order compactly filling each space with additional padding if necessary. The removed wooden slides can, in case the ordinary sized herbarium sheets are used, be placed breadth-ways at the side of the papers, or separately packed in one of the vacant cases.

The measurements as above given are such as are adapted to the size usually recommended of herbarium sheets, and genus covers, or medium wrapping paper size, allowing a small margin for occasional large specimens, or ease of storage and drawing out. These dimensions can of course be modified to suit particular cases, without interfering with the general plan.

By a slight modification on the inside, drawers may be substituted for slides, to receive bulky or irregular specimens, such as

fruits, cones, wood sections, etc., still keeping up a desired uniform outside appearance.

In the permanent herbarium, these cases can be snugly piled one on the other, in tiers three or four in height, and closely fitting at the sides. The lower cases might be raised a foot or more above the floor, or the least used orders, or duplicates, kept in the lowest space.

The height of two cases (39 inches) would be convenient in looking over and comparing specimens, and where scarcity of case room is not urgent, the best lighted spaces might be arranged at this height.

At a rough estimate such cases may be calculated to hold conveniently six hundred species of average botanical specimens.

The cost of such cases, depending of course, largely on the material used, and amount of finish, etc., has been fixed by a manufacturing firm here in Davenport, Iowa (M. B. Cochran & Co., school furniture dealers), at $6.50 per case. For a larger number (ten or more), or in case of an increased demand, the price could be materially reduced. I am indebted to the above firm for the use of the wood-cut, here given to illustrate this subject. The particular adaptation of such cases for school uses, to contain in convenient form the necessary material for illustrating botanical lessons, is too obvious to require more than simple mention at this time.

CHARLES ROBERT DARWIN.*

Charles Robert Darwin was born at Shrewsbury on Feb. 12, 1809. He is the son of Dr. Robert Waring Darwin, F.R.S., and grandson of Dr. Erasmus Darwin, F.R.S., author of the "Botanic Garden," "Zoonomia," etc.; by the mother's side he is grandson of Josiah Wedgwood, F.R.S., the celebrated manufacturer of pottery. Mr. Darwin was educated at Shrewsbury School under Dr. Butler, afterwards Bishop of Lichfield, and in the winter of 1825 went to Edinburgh University for two years. He there attended to marine zoology, and read before the Plinian Society at

* From "Nature," June 4, with a Portrait.

the close of 1826 two short papers, one on the movement of the ova of Flustra. From Edinburgh Mr. Darwin went to Christ's College, Cambridge, where he took his Bachelor of Arts degree in 1831. In the autumn of 1831, Capt. FitzRoy having offered to give up part of his own cabin to any naturalist who would accompany H.M.S. *Beagle* in her surveying voyage round the world, Mr. Darwin volunteered his services without salary, but on condition that he should have the entire disposal of his collections, all of which he deposited in various public institutions. The *Beagle* sailed from England Dec. 27, 1831, and returned Oct. 22, 1836.

Mr. Darwin married his cousin, Emma Wedgwood, in the beginning of 1839, and has lived since 1842 at Down, Beckenham, Kent, of which county he is a magistrate.

The Royal Society awarded to Mr. Darwin, in 1853, the Royal Medal, and in 1864 the Copley Medal. In 1859 the Geological Society awarded him the Wollaston Medal. He is an honorary member of various foreign scientific Societies, and is a Knight of the Prussian Order of Merit.

Since his return from South America in the *Beagle*, Mr. Darwin's life has been comparatively uneventful, even for a scientific man; indeed, so far as the public is concerned, the main events in Mr. Darwin's career have been the publication of his works and papers, which have been far more numerous than many are aware of. We give below a list of them:—

General Works. Journal of Researches into the Natural History and Geology of the countries visited by H.M.S. *Beagle*, 1845.

On the Origin of Species by means of Natural Selection, 1859.

This was preceded by a sketch, entitled "On the variation of organic beings in a state of nature;" published in the *Journal of the Linnæan Society*, vol. iii (Zool.), 1859, p. 46.

The Variation of Plants and Animals under Domestication. 2 vols. 1868.

The Descent of Man, and Selection in relation to Sex. 2 vols. 1871.

The Expression of the Emotions in Man and Animals. 1872.

Zoological Works. The Zoology of the voyage of H.M.S. *Beagle*, edited and superintended by C. Darwin, 1840; consisting of five parts.

A monograph of the Cirripedia, Part I, Lepadidæ; Ray Soc., 1851, pp. 400.

A monograph of the Cirripedia, Part 2, the Balanidæ; Ray Soc., 1854, pp. 684.

A monograph of the Fossil Lepadidæ; Pal. Soc., 1851, pp. 86.

A monograph of the Fossil Balanidæ and Verrucidæ; Pal. Soc., 1854, pp. 44.

Observations on the Structure of the genus Sagitta; Ann. Nat. Hist., vol. xiii, 1844.

Brief descriptions of several terrestrial Planariæ, and of some marine species; Ann. Nat. Hist., vol. xiv, 1844, p. 241.

Botanical Works. On the various contrivances by which British and Foreign Orchids are fertilized, 1862.

On the Movements and Habits of Climbing Plants; Journ. Linn. Soc., vol. ix, 1865, (Bot.), p. 1.—This Paper has also been published as a separate work.

On the action of Sea-water on the Germination of Seeds; Journ. Linn. Soc., vol. i, 1857 (Bot.), p. 130.

On the Agency of Bees in the Fertilization of Papilionaceous Flowers; Ann. Nat. Hist., vol. ii, 1858, p. 459.

On the Two Forms or Dimorphic Condition of the species of Primula; Journ. Linn. Soc., vol. vi, 1862 (Bot.), p. 77.

On the Existence of Two Forms and their reciprocal Sexual Relations in the genus Linum; Journ. Linn. Soc., vol. vii, 1863 (Bot.), p. 69.

On the Sexual Relations of the Three Forms of Lythrum; Journ. Linn. Soc., vol. viii, 1864, p. 169.

On the Character and Hybrid-like nature of the illegitimate Offspring of Dimorphic and Trimorphic Plants; Journ. Linn. Soc., vol. x, 1867 (Bot.), p. 393.

On the Specific Difference between *Primula veris* and *P. vulgaris*, and on the Hybrid Nature of the common Oxslip; Journ. Linn. Soc., vol. x, 1867 (Bot.), p. 437.

Notes on the Fertilization of Orchids; Ann. Nat. Hist., Sept., 1869.

Geological Works. The Structure and Distribution of Coral-reefs, 1842; pp. 214.

Geological Observations on Volcanic Islands, 1844; pp. 175.

Geological Observations on South America, 1846; pp. 279.

On the Connection of the Volcanic Phenomena in South America, etc.; Trans. Geol. Soc., vol. v; read March, 1838.

On the Distribution of the Erratic Boulders in South America; Trans. Geol. Soc., vol. vi; read April, 1841.

On the Transportal of Erratic Boulders from a lower to a higher level; Journ. Geol. Soc., 1848, p. 315.

Notes on the Ancient Glaciers of Caernarvonshire; Phil. Mag., vol. xxi, 1842, p. 180.

On the Geology of the Falkland Islands; Journ. Geol. Soc., 1846, pp. 267.

On a Remarkable Bar of Sandstone off Pernambuco; Phil. Mag., Oct., 1841, p. 257,

On the formation of Mould; Trans. Geol. Soc., vol. v, p. 505; read Nov., 1837.

On the Parallel Roads of Glen Roy; Trans. Phil. Soc., 1839, p. 39.

On the Power of Icebergs to make Grooves on a Submarine Surface; Phil. Mag., Aug., 1855.

An account of the Fine Dust which often falls on vessels in the Atlantic Ocean; Proc. Geol. Soc., 1845, p. 26.

Origin of the Saliferous Deposits of Patagonia; Journ. Geol. Soc., vol. ii, 1838, p. 127.

Part Geology; Admiralty Manual of Scientific Inquiry, 1849. Third ed., 1859.

NOTICE BY ASA GRAY.

Two British naturalists, Robert Brown and Charles Darwin, have, more than any others, impressed their influence upon science in this nineteenth century. Unlike as these men and their works were and are we may most readily subserve the present purpose in what we are called upon to say of the latter by briefly comparing and contrasting the two.

Robert Brown died sixteen years ago, full of years and scientific honors, and he seems to have finished several years earlier all the scientific work that he had undertaken. To the other, Charles Darwin, a fair number of productive years may yet remain, and are earnestly hoped for. Both enjoyed the great advantage of being all their lives long free from any exacting professional du-

ties or cares, and so were able in the main to apply themselves to research without distraction and according to their bent. Both, at the beginning of their career, were attached to expeditions of exploration in the southern hemisphere, where they amassed rich stores of observation and materials, and probably struck out, while in the field, some of the best ideas which they subsequently developed. They worked in different fields and upon different methods; only in a single instance, so far as we know, have they handled the same topic; and in this the more penetrating insight of the younger naturalist into an interesting general problem may be appealed to in justification of a comparison which some will deem presumptuous. Be this as it may, there will probably be little dissent from the opinion that the characteristic trait common to the two is an unrivalled scientific sagacity. In this these two naturalists seem to us, each in his way, preëminent. There is a characteristic likeness, too — underlying much difference — in their admirable manner of dealing with facts closely, and at first hand, without the interposition of the formal laws, vague ideal conceptions, or "glittering generalities" which some philosophical naturalists make large use of.

A likeness may also be discerned in the way in which the works or contributions of predecessors and contemporaries are referred to. The brief historical summaries prefixed to many of Mr. Brown's papers are models of judicial conscientiousness. And Mr. Darwin's evident delight at discovering that some one else has "said his good things before him," or has been on the verge of uttering them, seemingly equals that of making the discovery himself. It reminds one of Goethe's insisting that his views in morphology must have been held before him and must be somewhere on record, so obviously just and natural did they appear to him.

Considering the quiet and retired lives led by both these men, and the prominent place they are likely to occupy in the history of science, the contrast between them as to contemporary and popular fame is very remarkable. While Mr. Brown was looked up to with the greatest reverence by all the learned botanists, he was scarcely heard of by any one else; and out of botany he was unknown to science except as the discoverer of the Brownian motion of minute particles, which discovery was promulgated in a privately printed pamphlet that few have ever seen. Although Mr.

Darwin had been for twenty years well and widely known for his "Naturalist's Journal," his works on "Coral Islands," on "Volcanic Islands," and especially for his researches on the Barnacles, it was not till about fifteen years ago that his name became popularly famous. Since then no scientific name has been so widely spoken. Many others have had hypotheses or systems named after them, but no one else that we know of a department of bibliography. The nature of his latest researches accounts for most of the difference, but not for all. The Origin of Species is a fascinating topic, having interests and connections with every branch of science, natural and moral. The investigation of recondite affinities is very dry and special; its questions, processes, and results alike — although in part generally presentable in the shape of morphology — are mainly, like the higher mathematics, unintelligible except to those who make them a subject of serious study. They are especially so when presented in Mr. Brown's manner. Perhaps no naturalist ever recorded the results of his investigations in fewer words and with greater precision than Robert Brown: certainly no one ever took more pains to state nothing beyond the precise point in question. Indeed we have sometimes fancied that he preferred to enwrap rather than to explain his meaning; to put it into such a form that, unless you follow Solomon's injunction and dig for the wisdom as for hid treasure, you may hardly apprehend it until you have found it all out for yourself, when you will have the satisfaction of perceiving that Mr. Brown not only knew all about it, but had put it upon record long before. Very different from this is the way in which Mr. Darwin takes his readers into his confidence, freely displays to them the sources of his information, and the working of his mind, and even shares with them all his doubts and misgivings, while in a clear and full exposition he sets forth the reasons which have guided him to his conclusions. These you may hesitate or decline to adopt, but you feel sure that they have been presented with perfect fairness; and if you think of arguments against them you may be confident that they have all been duly considered before.

The sagacity which characterizes these two naturalists is seen in their success in finding decisive instances, and their sure insight into the meaning of things. As an instance of the latter on Mr. Darwin's part, and a justification of our venture to compare him with the *facile princeps botanicorum*, we will, in conclusion, allude

to the single instance in which they took the same subject in hand. In his papers on the organs and modes of fecundation in Orchideæ and Asclepiadeæ, Mr. Brown refers more than once to C. K. Sprengel's almost forgotten work, shows how the structure of the flowers in these orders largely requires the agency of insects for their fecundation, and is aware that "in Asclepideæ . . . the insect so readily passes from one corolla to another that it not unfrequently visits every flower of the umbel." He must also have contemplated the transport of pollen from plant to plant by wind and insects; and we know from another source that he looked upon Sprengel's ideas as far from fantastic. Yet instead of taking the single forward step which now seems so obvious, he even hazarded the conjecture that the insect-forms of some Orchideous flowers are intended to deter rather than to attract insects. And so the explanation of all these and other extraordinary structures, as well as of the arrangement of blossoms in general, and even the very meaning and need of sexual propagation, were left to be supplied by Mr. Darwin. The aphorism "Nature abhors a vacuum" is a characteristic specimen of the science of the Middle Ages. The aphorism "Nature abhors close fertilization," and the demonstration of the principle, belong to our age, and to Mr. Darwin. To have originated this, and also the principle of Natural Selection — the truthfulness and importance of which are evident the moment it is apprehended — and to have applied these principles to the system of nature in such a manner as to make, within a dozen years, a deeper impression upon natural history than has been made since Linnæus, are ample title for one man's fame.

There is no need of our giving any account or of estimating the importance of such works as the "Origin of Species by means of Natural Selection," the "Variation of Animals and Plants under Domestication," the "Descent of Man, and Selection in relation to Sex," and the "Expression of the Emotions in Man and Animals,"— a series to which we may hope other volumes may in due time be added. We would rather, if space permitted, attempt an analysis of the less known, but not less masterly, subsidiary essays upon the various arrangements for ensuring cross-fertilization in flowers, for the climbing of plants and the like. These, as we have heard, may before long be reprinted in a volume, and supplemented by some long-pending but still unfinished investigations

upon the action of Dionæa and Drosera — a capital subject for Mr. Darwin's handling.

Apropos to these papers, which furnish excellent illustrations of it, let us recognize Darwin's great service to natural science in bringing back to it Teleology: so that, instead of Morphology *versus* Teleology, we shall have Morphology wedded to Teleology. To many, no doubt, Evolutionary Teleology comes in such a questionable shape as to seem shorn of all its goodness; but they will think better of it in time, when their ideas become adjusted, and they see what an impetus the new doctrines have given to investigation. They are much mistaken who suppose that Darwinism is only of speculative importance and perhaps transient interest. In its working applications it has proved to be a new power, eminently practical and fruitful.

And here, again, we are bound to note a striking contrast to Mr. Brown, greatly as we revere his memory. He did far less work than was justly to be expected from him. Mr. Darwin not only points out the road, but labors upon it indefatigably and unceasingly. A most commendable *noblesse oblige* assures us that he will go on while strength (would we could add health) remains. The vast amount of such work he has already accomplished might overtax the powers of the strongest. That it could have been done at all under constant infirm health is most wonderful.

A KEY TO THE HIGHER ALGÆ OF THE ATLANTIC COAST, BETWEEN NEWFOUNDLAND AND FLORIDA.

BY PROF. D. S. JORDAN.

PART II. RHODOSPERMEÆ.

(RED ALGÆ).

PLANTS rosy red or purple, rarely brown-red or greenish red, becoming, when exposed to sunlight, dull green or yellowish. Fructification of two kinds; diœcious:—1. *Spores* contained either in external or immersed conceptacles, or densely aggregated together and dispersed in masses throughout the substance of the frond; 2. *Tetraspores*, red or purple, either external or immersed

in the frond, rarely contained in proper receptacles; each tetraspore enveloped in a pellucid skin, and at maturity splitting into four sporules. Antheridia filled with yellow or hyaline corpuscles. Ours all marine (except *Bostrychia*), and chiefly below low water mark. . . . . **A**

A. *Frond calcareous, rigid: its cells containing Carbonate of Lime,* . . . . . CORALLINACEÆ. **P**

A. *Frond expanding horizontally, lichen-like, but not calcareous,* . . . . . SQUAMARIÆ. **V**

A. *Frond not calcareous nor lichenoid,* . . . . . **B**

B. *Frond mostly cylindrical, partly or entirely articulate,* . **C**

B. *Frond not articulate anywhere,* . . . . . **G**

C. *Nodes much constricted,* . . . . . **D**

C. *Nodes not specially constricted,* . . . . . **E**

D. *Joints obvious throughout, long in the main stems and gradually shorter above, spherical at the tips; color bright, sometime gold-tinted,* . . GRIFFITHSIA in CERAMIACEÆ. **d**

D. *Terminal joints not spherical: colors duller, often greenish,* CHAMPIA in LAURENCIACEÆ. **W**

E. *Sporiferous nucleus in external spherical conceptacles: axis polysiphonous (of 4 or more tubes): joints not distinct on older parts of frond,* . RHODOMELACEÆ. **M**

E. *Axis monosiphonous: joints usually obvious: colors mostly bright,* . . . . . **F**

F. *Branches beset with short, fine, mostly simple filaments* SPYRIDIACEÆ. **f**

F. *Not as above; mostly profusely branching; frond sometimes two edged,* . . . . . CERAMIACEÆ. **d**

G. *Frond flat, with an evident midvein,* . . . . . SPHÆROCOCCOIDEÆ. **Q**

G. *Frond without a midvein,* . . . . . **H**

H. *Sporiferous nucleus consisting of tufted spore-threads attached to a placenta; single spores in each cell of the spore thread, or only in the terminal cell. (Fronds rarely flat or fan-shaped, mostly less leathery in texture than the next.)* . . . . . **J**

H. *Sporiferous nucleus subglobose, either simple or formed of many nucleoli; numerous spores without order in a membranaceous mother-cell. (Fronds leathery, often large, and rarely adhering closely to paper.)* . . . I

I. *Frond composed of polygonal cells; often flat or fan-shaped,* RHODYMENIACEÆ. X

I. *Fronds various, rarely truly fan-shaped; the ultimate structure being jointed filaments compacted together by gelatine,* . . . . . CRYPTONEMIACEÆ. Z

J. *Nucleus in an external, ovate or spherical conceptacle,* . K

J. *Nucleus not as above; cylindrical, dichotomously forked,* L

K. *Cylindrical; branches mostly tapering towards base and apex; superficial cellules very minute,* . . . . . GELIDIACEÆ. T

K. *Cylindrical or flat; surface covered with small cells; branches not tapering to base (except in* CHONDRIA) RHODOMELACEÆ. M

K. *Without above combinations; frond flat in our species,* SPHÆROCOCCOIDEÆ. Q

L. *Nucleus in wart-like excrescences; frond fan-shaped; apices attenuate, of equal length,* . SPONGIOCARPEÆ. U

L. *Nucleus immersed in the frond; apices blunt,* . . . . HELMINTHOCLADEÆ. W

M. Frond cylindrical, at least the branchlets or younger parts articulate, ... N

M. Frond not articulate anywhere, ... O

N. Frond elongated; main stem mostly inarticulate, but thickly beset with fine jointed branching filaments which bear the fruit, ... *Dasya.* v

N. Joints of frond, longitudinally striate; mostly dark red, and profusely branching, ... *Polysiphonia.* m

N. Frond tessellated with oblong or squarish, purple cells; small—about 1 inch high, ... *Bostrychia* u

O. Frond flat, pinnatifid; obscurely midribbed, . . *Odonthalia.* g

O. Cylindrical; branches tapering toward the base, . *Chondria.* h

O. Cylindrical; branches not tapering to base, . . *Rhodomela.* k

P. Frond pinnate: jointed; 2 to 4 inches high, . . . *Corallina.* x

P. Frond lobed or orbicular, attached by its base or centre, . . *Melobesia.* y

P. Frond a red incrustation on rocks in deep water, *Nullipora* (?). z

Q. Tetraspores in definite sori; frond flat, with a midvein, . . . R
Q. Frond flat, without a midvein; spores not in sori, ... S
R. Delicate, rosy red; lamina unbranched; no lateral veins, . . *Grinnellia.* A^3
R. Fronds with veins and veinlets or else branched, . *Delesseria.* B^1
S. Frond compressed in our species, laciniate, . . *Gracilaria.* E^1
S. Frond flat, laciniate, delicate and rosy, often veiny, *Nitophyllum.* C^3
S. Frond flat, leathery, margined with wing-like segments, . . . *Calliblepharis.* D^3
T. Frond slightly compressed; branchlets slender at base, *Gelidium.* F^2
T. Coarser; cylindrical; succulent and flaccid, . . . *Solieria.* G^2
T. Frond filiform, much branched; branches clothed with small pointed branchlets, ... *Hypnea.* H^2
U. Dark brown, cartilaginous; not adhering to paper, . *Polyides.* I^2
V. Suborbicular; red-black, ... *Peyssonnelia.* J^2
W. Regularly dichotomous and level-topped, ... *Scinaia.* L^2
W. Sparingly dichotomous; worm-like, ... *Nemalion.* K^2
X. Frond flat, fan-shaped, multifid, ... Y
X. Frond linear, two-edged, pectinate-pinnatifid, . *Plocamium.* O^2
X. Frond terete, alternately decompound, . . . *Cordylecladia.* P^2
Y. Frond stipitate, palmately cleft; usually large and dark, . . . *Rhodymenia.* M^2
Y. Roseate; dichotomously or pinnately multifid, . . *Euthora.* N^2
Z. More or less flattened or compressed, ... a
Z. Cylindrical, ... b
a. Frond stipitate, regularly fan-shaped, very variable in color and form; shallow water, ... *Chondrus.* W^2
a. Frond stipitate, irregularly cleft, proliferous; deeper water, *Phyllophora.* Q^2
a. Channelled on one side, convex on the other; covered with little tubercles or frondlets, ... *Gigartina.* V^2
a. Frond rigid, 2 to 3 inches high; dichotomous; axils rounded; apices blunt, ... *Gymnogongrus.* R^2
a. Frond 1 to 2 feet long; margin fringed, with frondlets, . . . *Grateloupia.* a^2
a. Frond broad, palmate, fringed with cilia; brilliant. *Callophyllis.* U^2
b. Frond stiff, very rigid and horny; axils rounded, . *Ahnfeltia.* S^2
b. Frond very bushy; branchlets with a chain of swollen nodes containing conceptacles, or else tendril bearing, ... *Cystoclonium.* T^2
b. Frond delicate, much branched, adhering closely to paper, *Gloiosiphonia.* . . . . . b^2
b. Not as above, and less common, ... c
c. Frond hollow, simple or with similar hollow branches, . . . *Halosaccion.* Y^2
c. Branchlets mostly opposite and tapering to base; usually secund or arching, stem constricted, adheres to paper, *Chylocladia.* X^1

c. Fronds level topped, dichotomous; axils and apices acute; ends in fruit swollen into pod-shaped receptacles, . *Furcellaria.* Z³
d. Frond decidedly constricted at the nodes, . . . *Griffithsia.* j³
d. Frond two edged, decompound pinnate, pinnæ opposite, *Ptilota.* g³
d. Frond filiform, ... e
e. Tetraspores sunk in the frond; axils rounded; branches dichotomous and commonly ending in little forks, which are often incurved, ... *Ceramium.* d³
e. Tetraspores external; much branched; rarely dichotomous or with the apices hooked, ... *Callithamnion.* k³
e. Tetraspores external; whorls of short, curved branchlets at the nodes, ... *Halurus.* i³
f. Surface coated with small cells, ... *Spyridia.* c³
g. Pinnately decompound; axils obtuse, apices acute, ... 54
h. Branchlets club-shaped, obtuse, ... i
h. Branchlets acute at each end, ... j
i. Stem stout, mostly excurrent, ... 55
i. Slender, generally forking near base, ... 56
j. Frond slender, with setaceous branchlets, ... 57
j. Stout, with thick branchlets, ... 58
k. Substance soft, closely adhering to paper, ... l
k. Rather rigid; scarcely adhering to paper, ... 59
l. Brownish red, pinnately much branched, ... 60
l. Rosy, staining paper; more slender and regularly pinnate, . . 61
m. Primary tubes four only, ... n
m. Primary tubes 6 to 25, ... s
n. Visibly articulate throughout; dissepiments pellucid, . . . o
n. Stem and larger branches apparently not jointed, ... r
o. Branches widely spreading, beset with spine-like branchlets, . p
o. Branches not spinous nor divaricate, ... g
p. Rigid and bushy; not collapsing when drawn from the water; joints very short, ... 66
p. Flaccid and silky; joints longer, ... 65
q. Dark; tips with tufts of roseate fibrils, ... 64
q. Full red; in small dense tufts or wads which adhere closely to paper, ... 63
q. Coarser; less densely tufted; scarcely adhering, ... 62
r. Red brown; branches long, twig-like, sometimes with pencils of fine rosy branchlets; stem scarcely adhering to paper, . . 67
r. Dull, brownish; tips fibrilliferous; joints striate; adhering to paper, ... 68
r. Brighter colored, more branched and with longer joints, . . 69
s. Pinnately much branched, scarcely jointed; branches mostly naked below and pinnate above; blackish; substance rigid and wiry, not adhering closely to paper; excessively variable, ... 73
s. Internodes long; branches feathery at the tips; adheres to paper; a deep water variety of No. 73 (?) 74

s. Forming globose, rigid, dark brown tufts on Fucus nodosus; joints mostly short, with a dark central spot, ... 75
s. Small, rigid, full red, distichous, many times pinnate, with subulate pinnules, ... 71
s. With none of the above combinations of characters, ... t
t. Dichotomous or zigzag; bright purplish, adhering to paper, . 70
t. Densely tufted; not dichotomous; full red; scarcely adhering . 72
u. River mouths, etc., sometimes in fresh water, ... 76
v. Bright red, closely adhering to paper, ... 77
w. Shallow water, etc.; adheres to paper; variable, ... 78
x. Lurid purple; green when exposed, white when bleached, . . 79
y. Others probably occur; S. T. Olney mentions No. 80
z. Common on the Mass. coast; said by Mr. Bicknell to be No. . 81
A.[2] Brilliant, very delicate; adhering closely, ... 82
B.[2] Fronds like oak-leaves; pinnatifid or sinuate; deep water, . . 83
B.[2] Alternately or dichotomously branched; roseate, ... 84
B.[2] Frond undivided, proliferously branched from the midvein, . . 85
B.[2] Frond dichotomous; constricted, almost jointed at the nodes, rooting or proliferous at the forks; purple, ... 86
C.[2] Frond somewhat rigid; sori oblong, ... 87
C.[2] Frond soft, thin, flaccid; sori round, ... 88
D.[2] Dark red-purple; apices sometimes cirrhous, ... 89
E.[2] Much divided; conceptacles prominent; variable, ... 90
F.[2] Purplish; rather rigid, ... 91
G.[2] Dark or blood-red; adheres to paper; variable, ... 92
H.[2] Branches which bear tetraspores, pod-like in the middle, . . 93
I.[2] Very dark red-brown; does not adhere to paper, ... 94
J.[2] Red-black; margin paler, ... 95
K.[2] Dull purplish, adhering to paper, ... 96
L.[2] Rosy red; level-topped; tender, ... 97
M.[2] Tetraspores in cloudy patches; large; common, ... 98
M.[2] Tetraspores in distinct sori; small; rare, ... 99
N.[2] Bright crimson; scarcely adhering to paper, ... 100
O.[2] Lower branchlets entire; upper pectinate, ... 101
P.[2] Livid purple; sometimes compressed; densely tufted, ... 102
Q.[2] Tetraspores in excrescences (nemathecia) at the tips of the laminæ; clear red, ... 103
Q.[2] Nemathecia forming dark colored, convex patches at the centre of the laminæ; dull red, ... 104
R.[2] Compressed; segments forked at tips, ... 105
R.[2] Flat; axils very much rounded, ... 106
S.[2] Densely tufted; wiry; does not collapse, ... 107
T.[2] Fruiting branches mostly tapering to base; excessively variable, 108
U.[2] Bright red; palmate; rare, ... 109
V.[2] Dark red; rigid and dichotomous, ... 110
W.[2] Often iridescent; greenish in shallow water and bleaching to white; sori purplish, like drops of blood; common, . . . 111
X.[2] Much divaricate; branches tubular, ... 112

X.² Pinnate; branches mostly opposite and compound, ... 113
Y.² Very densely tufted; often distorted; livid purple, ... 114
Z.² Similar, except in fruit, to Polyides, ... 115
a.² Frond multifid; laciniæ very long, ... 116
a.² Frond pinnately decompound, ... 117
b.² Much branched; older parts hollow, ... 118
c.² Branches spreading; covered with small branchlets, ... 119
c.² Branches straggling; often revolute; shorter and stouter, . . 120
d.² Internodes entirely diaphanous; surface cells only at the nodes, e²
d.² Coarser; internodes not entirely diaphanous; common and variable, ... 121
e.² Joints everywhere as long as broad; of a single colored cell; forming mats on rocks, ... 122
e.² Frond of equal diameter throughout; lower joints rosy; 4 to 6 times as long as broad; upper shorter, ... 124
e.² Attenuated above: lower joints 3–4 times as long as broad, . . f
f.² Nodes swollen: internodes pellucid, ... 123
f.² Nodes not swollen: lower internodes striate, ... 125
g.² Pinnæ opposite, unlike; the one undivided leaf-like, the other branch-like pinnately-compound, ... 126
g.² Pinnæ opposite, mostly similar, ... h²
h.² Pinnæ articulated: dark purple: adheres to paper, ... 128
h.² Pinnæ unequal: northern: rare in America, ... 127
i.² Branchlets very numerous, incurved, ... 129
j.² Adheres closely to paper: common: variable, ... 130
k.² Frond shrub-like, pyramidal, with an excurrent main stem which is not obviously articulate, ... l²
k.² Frond shrub-like, or alternately decompound, with dichotomous branchlets: color *not* rose-purple: commonly drying pale or brown red, ... o²
k.² Fronds alternately decompound: a pair of minute opposite branchlets at each node; mostly brilliant, ... p²
k.² Branchlets few and distant, with whorls of opposite fibres at apex, ... 149
k.² Without above characters: an inch or more high, densely tufted, mostly rose-purple, and obviously jointed throughout, ... m²
k.² Frond ¼–1 inch, arising from creeping, matted threads, . . . 144
k.² Frond ¼ inch or less high: parasitic, not rising from matted threads, and mostly but slightly branched, ... r²
l.² Joints in branches twice as long as broad, ... 131
l.² Joints in branches 3–4 times as long as broad: nodes swollen, . 132
m.² Plumules fan-shaped, bare of branches in the lower half, . . . 133
m.² Pinnate: plumules with zigzag rachis: joints of branches 10 times as long as broad, ... 136
m.² Without above characters, ... n²
n.² Densely tufted: bright rose purple: filaments finer than human hair: joints 3–8 times as long as broad, ... 135

n.² Somewhat coarser, with shorter joints: plumules distichous, . 134
o.² Slender, shrub-like, distinguished at once from other Callithamnia by the bead-like chains of fruit (scirospores): common, often greenish: (Formerly and perhaps more properly considered as the type of a separate genus, as *Scirospora Griffithsiana* Harv.), ... 138
o.² Articulate throughout, branches ending in little corymbs of branchlets, ... 137
p.² Branchlets pectinate, secund, recurved, on the upper side only of branches: a beautiful and rare little species: specimens of which were found at Penikese in 1873, by Miss Susan Bowen, ... 139
p.² Branchlets simple, subulate, ... 142
p.² Branchlets, or some of them in fours, pinnate, ... 143
p.² Without above characters; branchlets opposite, pinnate, or bipinnate, ... q²
q.² Joints 4–10 times as long as broad: brilliant: frequent, . . . 140
q.² Joints shorter: less common, ... 141
r.² Forming a dense purple fringe on Zostera: branches long, secund, ... 145
r.² Forming crimson patches on rocks: branches long, erect, . . 146
r.² Forming velvety tufts on Dasya: branches bud-like, secund, . 147
r.² Forming a fleecy, pink-down on Ceramium rubrum: branches spreading, curved: frequent, ... 148

54. ODONTHALIA DENTATA Lyngby. Maine and North. 3–12.
55. CHONDRIA DASYPHYLLA Agardh. Coast. 6–12.
56. CHONDRIA BAILEYANA Montagne. Coast. 6–8.
57. CHONDRIA TENUISSIMA Agardh. Boston to New York. 4–6.
58. CHONDRIA ATROPURPUREA Harvey. South Carolina and South. 4–10.
59. RHODOMELA SUBFUSCA Agardh. New Jersey and North. 6–12.
60. RHODOMELA GRACILIS Kützing. Massachusetts and North. 4–12.
61. RHODOMELA ROCHEI Harvey. New Jersey to Massachusetts. 4–8.
62. POLYSIPHONIA URCEOLATA Greville. Virginia and North. 6–12.
63. POLYSIPHONIA FORMOSA Suhr. New Jersey and North. 4–8.
64. POLYSIPHONIA SUBTILISSIMA Montagne. New Jersey and North. 2–4.
65. POLYSIPHONIA OLNEYI Harvey. Long Island and North. 3–5.
66. POLYSIPHONIA HARVEYI Bailey. Boston to New Jersey. 2–4.
67. POLYSIPHONIA ELONGATA Greville. Massachusetts, etc. 6–12.
68. POLYSIPHONIA FIBRILLOSA Greville. New Jersey to Massachusetts. 5–8.
69. POLYSIPHONIA VIOLACEA Greville. New York and North. 6–82.
70. POLYSIPHONIA VARIEGATA Agardh. Coast. 2–8.
71. POLYSIPHONIA PARASITICA Greville. Rhode Island, etc. 1–3.
72. POLYSIPHONIA ATRORUBESCENS Greville. New Jersey to Rhode Island. 1–3.
73. POLYSIPHONIA NIGRESCENS Greville. Coast. 3–15.
74. POLYSIPHONIA AFFINIS Moore. Coast. 4–12.
75. POLYSIPHONIA FASTIGIATA Greville. New York to Halifax. 1–2.
76. BOSTRYCHIA RIVULARIS Harvey. New York to Florida. ½–1.
77. DASYA ELEGANS Agardh. Cape Cod and South. 6–36.
78. CHAMPIA PARVULA Harvey. Cape Cod and South. 2–4.
79. CORALLINA OFFICINALIS L. New Jersey and North. 2–4.
80. MELOBESIA PUSTULATA Lamouroux. Rhode Island, etc.
81. NULLIPORA POLYPHYLLAMEA (?). New York and North. (A. Melobesia?)

82. GRINNELLIA AMERICANA Harvey. New Jersey to Massachusetts. 4–24.
83. DELESSERIA SINUOSA Lamouroux. New York and North. 3–8.
84. DELESSERIA ALATA Lamouroux. Cape Cod and North. 2–6.
85. DELESSERIA HYPOGLOSSUM Lamouroux. Virginia and South. 3–5.
86. DELESSERIA LE PRIEURII Montagne. West Point and South. 1–2.
87. NITOPHYLLUM LACERATUM Greville. Maine and North. 6–8.
88. NITOPHYLLUM PUNCTATUM Greville. North Carolina and South. 2.
89. CALLIBLEPHARIS CILIATA Kützing. Massachusetts and North. 2–8.
90. GRACILARIA MULTIPARTITA Agardh. Coast. 6–12.
91. GELIDIUM CORNEUM Lamouroux. Coast. 2–5.
92. SOLIERIA CHORDALIS Agardh. Cape Cod and South. 6–14.
93. HYPNEA MUSCIFORMIS Lamouroux. Cape Cod and South. 4–8.
94. POLYIDES ROTUNDUS Greville. New York to Boston. 2–3.
95. PEYSSONNELIA IMBRICATA Kützing. Newfoundland.
96. NEMALION MULTIFIDUM Agardh. Long Island and North. 6–10.
97. SCINAIA FURCELLATA Bivona. Rhode Island and South. 2–4.
98. RHODYMENIA PALMATA Greville. (*Dulse.*) Virginia and North. 6–18.
99. RHODYMENIA PALMETTA Greville. Halifax. 1–3.
100. EUTHORA CRISTATA Agardh. Cape Cod and North. 1–3.
101. PLOCAMIUM COCCINEUM Lyngby. Massachusetts. 3–5.
102. CORDYLECLADIA (?) HUNTII Harvey. Rhode Island. 2–3.
103. PHYLLOPHORA BRODIEI Agardh. Cape Cod and North. 3–4.
104. PHYLLOPHORA MEMBRANIFOLIA Agardh. Cape May and North. 3–4.
105. GYMNOGONGRUS TORREYI Agardh. New York 4–7.
106. GYMNOGONGRUS NORVEGICUS Agardh. Maine. 2–3. Lynn Beach.
107. AHNFELTIA PLICATA Fries. New Jersey and North. 5–10.
108. CYSTOCLONIUM PURPURASCENS Kützing. Cape May and North. 6–14.
109. CALLOPHYLLIS LACINIATA Kützing. Delaware. 3–6.
110. GIGARTINA MAMILLOSA Agardh. Cape Coast and North. 3–6.
111. CHONDRUS CRISPUS Lyngby. (*Irish Moss.*) New Jersey and North. 3–8.
112. CHYLOCLADIA BAILEYANA Harvey. Cape Cod and South. 2–3.
113. CHYLOCLADIA ROSEA Harvey. Long Island to Maine. 1–2.
114. HALOSACCION RAMENTACEUM Ag. New Hampshire and North. 10–14.
115. FURCELLARIA FASTIGIATA Lyngby. Newfoundland. 4–8.
116. GRATELOUPIA GIBBESI. Harvey. South Carolina. 6–20.
117. GRATELOUPIA FILICINA Agardh. Georgia and South. 6–12.
118. GLOIOSIPHONIA CAPILLARIS Carmichael. New England. 4–6.
119. SPYRIDIA FILAMENTOSA Harvey. Coast. 3–10.
120. SPYRIDIA FILAMENTOSA var. REFRACTA Harvey. Massachusetts to Florida. 3–8.
121. CERAMIUM RUBRUM Agardh. South Carolina to Greenland. 2–10.
122. CERAMIUM HOOPERI Harvey. Cape Cod, North. 1–2.
123. CERAMIUM DIAPHANUM Roth. Boston, South. 2–4.
124. CERAMIUM FASTIGIATUM Harvey. Virginia to Maine. 2–4.
125. CERAMIUM ARACHNOIDEUM (?) Agardh. New Jersey to Massachusetts. 1–2.
126. PTILOTA SERRATA Kützing. Cape Cod and North. 4–6.
127. PTILOTA PLUMOSA Agardh. Halifax, North. 4–6.
128. PTILOTA ELEGANS Bonnemaison. Boston, South. 3–6.
129. HALURUS EQUISETIFOLIUS Kützing. New York (?) 6–8.
130. GRIFFITHSIA CORALLINA Harvey. Boston, South. 3–6.
131. CALLITHAMNION TETRAGONUM Agardh. New England. 3–4.
132. CALLITHAMNION BAILEYI Harvey. New York to Massachusetts. 2–3.
133. CALLITHAMNION BORRERI Agardh. New York to Cape Cod. 1–3.
134. CALLITHAMNION POLYSPERMUM Agardh. New York and South. 2–3.
135. CALLITHAMNION BYSSOIDEUM Arn. New Jersey to Massachusetts. 1–3.
136. CALLITHAMNION DIETZIÆ Hooper. Long Island. 2–3.
137. CALLITHAMNION CORYMBOSUM Agardh. New York and North. 2–3.
138. CALLITHAMNION SEIROSPERMUM Griffiths. New York to Maine. 3–5.
139. CALLITHAMNION PLUMULA Lyngby. Long Branch and Penikese, 1–2.

140. CALLITHAMNION AMERICANUM Harvey. New York and North. 3–4.
141. CALLITHAMNION PYLAISEI Montague. Cape Cod and North. 3–4.
142. CALLITHAMNION FLOCCOSUM Agardh. Massachusetts. 4–6.
143. CALLITHAMNION CRUCIATUM Agardh. New York. 1–1½.
144. CALLITHAMNION TURNERI Agardh. Coast. ½–1.
145. CALLITHAMNION LUXURIANS Agardh. New York and North.—
146. CALLITHAMNION ROTHII Lyngby. Connecticut.—
147. CALLITHAMNION VIRGATULUM Harvey. New York.—
148. CALLITHAMNION DAVIESII Agardh. Massachusetts.—
149. CALLITHAMNION TENUE Harvey. New Jersey. 3–4.

PART III. CHLOROSPERMEÆ.

(GREEN ALGÆ.)

PLANTS grass-green, rarely brownish, bluish or purple, a few low forms red. Propagation in our species by simple cell-division, or by transformation of the coloring matter (endochrome) of the cells of the whole or a part of the frond, into zoospores. In all waters and damp places.* **A**

A. *Fronds filamentous, articulated; endochrome diffused: spores small.* . . . . . CONFERVACEÆ. **H**

A. *Fronds various, never truly jointed.* . . . . . **B**

B. *Frond tubular and hollow often branched or else broad and flat, membranous, composed of simple quadrate cells.* **C**

B. *Fronds composed of a simple filiform often profusely branching cell, or of many such cells united into a sponge-like body; often bright green and plume-like.* SIPHONACEÆ. **E**

B. *Frond with an annulated pith, composed of very short cellules, surrounded by a membranous, inarticulate, tubular sheath.* . . . . OSCILLATORIACEÆ. **I**

B. *Microscopic, unicellular; growth by semisection of the cell.* **D**

C. *Color bright green at all times.* . . . . ULVACEÆ. **G**

C. *Olivaceous or purplish, becoming bright purple when dry or in fruit.* . . . . . PORPHYRACEÆ. **F**

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* For descriptions of our numerous fresh water Chlorosperms and for a more recent arrangement of families than the one here adopted, see Prof. H. C. Wood's excellent "Contributions to the History of the Fresh Water Algæ of North America."

D. *Green — cell-walls membranous; fresh water — chiefly or entirely.* . . . . . DESMIDIACEÆ.*

D. *Yellow brown; cell-walls silicious.* DIATOMACEÆ.*

E. Frond sponge-like, of densely interwoven filaments, . *Codium.* J
E. Filaments free, plume-like, pinnately branched, . . *Bryopsis.* L
E. Filaments numerous, tufted or matted at base, free above, irregularly branched, ... *Vaucheria.* K
F. Frond tubular, ... *Bangia.* N
F. Frond flat, simple or cleft, ... *Porphyra.* M
G. Frond flat, sometimes saccate while young, ... *Ulva.* Q
G. Frond tubular, often branched, ... *Enteromorpha.* O
H. Filaments tufted, branched, ... *Cladophora.* S
H. Filaments unbranched; nodes not constricted, . *Chætomorpha.* b
H. Filaments unbranched; constricted at the nodes; joints very short, ... *Hormotrichum.* f
I. Filaments long, flexible, bundled together, ... *Lyngbya.* g
I. Filaments short, tufted, erect, fixed at base, . . . *Calothrix.* l
I. Filaments rigid, needle-shaped, lying loosely in a mucous matrix; vividly oscillating; commonly floating, . . *Oscillatoria.**
J. Fronds erect, dichotomous, clothed with soft hairs, ... 149
K. Not much branched; cell walls thin, ... 150
L. Common and variable; with a bright glassy lustre when dry, . 151
M. Fruit — minute dark purple granules, arranged in fours, . . . 152
N. In fresh or salt water forming large dark purple patches, . . . 153
N. Forming a minute rosy down on Chondria, etc., ... 154
O. Frond never branched, large and bag-like when fully grown, . 155
O. Frond branched; branches simple, obtuse, ... 156
O. Frond branched; branches beset with branchlets, ... P
P. Fronds slender, tufted, ... 157
P. Fronds very fine and feathery; branchlets articulated, conferva-like, ... 158
Q. Membrane formed of a double layer of cells; . . . . . R
Q. Membrane formed of a single layer of cells; semi-transparent; frond very delicate, saccate while young, becoming cleft; adheres closely to paper, ... 161
R. Frond lanceolate, composed of two closely applied membranes; adheres to paper, ... 159
R. Frond polymorphous, flat, smooth and glossy; common, . . 160
S. Filaments rigid, dark green tufted, cell walls thick; joints 3 to 4 times as long as broad, ... 162
S. Filaments soft, forming dense, spongy fastigiate pale green tufts, T
S. Filaments loosely tufted, stout, scarcely collapsing when drawn from the water; vivid green; joints 3 to 6 times as long as broad, ... a

* Omitted.

S. Dull green, scarcely adhering to paper; branches few, spreading with wide axils; in brackish or fresh waters, ... 175
S. Not as above; filaments loosely tufted sometimes interwoven, feathery, very slender; pale or bright green, ... V
T. Joints below about twice—above, 6 to 8 times as long as broad, U
T. Joints uniformly about twice as long as broad; tufts short, globose 165
U. Tufts starry, of a brilliant glossy green retained in drying, . . 163
U. Tufts globose small, yellow-green; on small algæ, ... 164
V. Joints 6 to 10 times longer than broad; bright yellow-green, . 171
V. Joints 3 to 5 times longer than broad; pale or yellow-green; not adhering closely to paper, ... Z
V. Joints 2 to 4 times as long as broad; mostly adhering to paper, W
W. Dark or brilliant green (often drying pale); nodes not constricted; excessively branched, ... Y
W. Pale or glaucous green; nodes mostly constricted, ... X
X. Excessively branched; ultimate divisions secund-pectinate; joints uniformly three times as long as broad, ... 166
X. Less branched, with longer joints; main branches long, flexuous, almost naked, ... 167
Y. Rather rigid; branches recurved-pectinate; joints 2 to 4 times as long as broad, ... 169
Y. Stems long, flexuous; branches long, with short branchlets; joints shorter, ... 168
Z. Pale greenish, forming spongy tufts; nodes slightly constricted, 170
Z. Yellow green; very flexuous; forming silky tufts, ... 172
a. Bright yellow green, fading when dry: branches crowded, . . 173
a. Full green; branches distant, nearly naked, ... 174
b. Joints 3 or more times as long as broad, ... c
b. Joints 1½ to 3 times as long as broad, ... d
b. Joints not longer than broad, yellowish, rather rigid but collapsing when drawn from the water, ... 178
c. Very rigid, glossy green; not adhering to paper; deep water, 176
c. Pale and flaccid; nodes very long, swollen, pale green, . . . 180
d. Soft and flaccid; adhering closely to paper, ... 179
d. Coarse and rigid, dark green; filaments straight, ... 177
d. Filaments twisted, very slender but somewhat harsh, ... e
e. Mostly floating; joints less than twice as long as broad, . . . 181
e. On rocks, etc., joints twice as long as broad or more, ... 182
f. Joints about as long as broad; substance rather firm, ... 183
f. Joints twice as broad as long, substance rather soft, ... 184
g. Cell walls thick, ... h
g. Cell walls thin, ... i
h. In large dark green tufts; filaments thick and tenacious, . . . 185
h. On rocks, etc., rusty or olivaceous; filaments upright in the water, 187
i. Northern species, floating in mats in stagnant salt waters or spreading in thin strata on mud, ... j

i. Southern, blackish green, floating or attached to small algæ, . k
j. Bluish green or rusty red; filaments tenacious, ... 186
j. Blackish green or violaceous; filaments not half so stout as in the preceding. 188
k. Filaments 1 to 2 inches long; scarcely interwoven; the endochrome not very distinctly annulated. 189
k. Minute; filaments densely matted together; annulations more distinct. 190
l. In little starry tufts on the smaller algæ. 191
l. In velvety patches on rocks, etc. . . . . m
m. Filaments flexuous, simple; common on rocks, rendering them very slippery. 192
m. Filaments longer and straighter, often appearing branched, by the splitting of the endochrome ("viviparous"), ... 193

150. CODIUM TOMENTOSUM Stackh. Florida. 3-24.
151. VAUCHERIA (species undescribed in Phycologia Brittanica, allied to V. marina) Buzzard's Bay, etc. 2-3.
152. BRYOPSIS PLUMOSA Lamouroux. Massachusetts and South. 3-6.
153. PORPHYRA VULGARIS Agardh. Charleston and North. 2-10.
154. BANGIA FUSCOPURPUREA Lyngby. New Jersey and North. 2-3.
155. BANGIA CILIARIS Carmichael. South Carolina. One-tenth.
156. ENTEROMORPHA INTESTINALIS Link. Whole Coast. 3-10.
157. ENTEROMORPHA COMPRESSA Greville. Whole Coast. 3-8.
158. ENTEROMORPHA CLATHRATA Greville. Cape May and North. 2-6.
159. ENTEROMORPHA HOPKIRKI M'Calla. New York, Massachusetts. 3-4.
160. ULVA (PHYCOSERIS) LINZA Linnæus. New Jersey and North. 6-12.
161. ULVA (PHYCOSERIS) LATISSIMA Linnæus. Whole Coast. 6-24.
162. ULVA LACTUCA Linnæus. Massachusetts, Texas. 6-12.
163. CLADOPHORA RUPESTRIS Linnæus. Maine and North. 2-8.
164. CLADOPHORA ARCTA Dillwen. New Jersey and North. 2-3.
165. CLADOPHORA LANOSA Roth. Massachusetts. 1-1½.
166. CLADOPHORA UNCIALIS Flora Danica. Cape Cod and North. 1.
167. CLADOPHORA GLAUCESCENS Griffiths. Whole Coast. 3-5.
168. CLADOPHORA FLEXUOSA Griffiths. New Jersey and North. 3-5.
169. CLADOPHORA MORRISIÆ Harvey. Delaware. 6-8.
170. CLADOPHORA REFRACTA Roth. Whole Coast. 2-3.
171. CLADOPHORA ALBIDA Hudson. New York, Massachusetts. 6-8.
172. CLADOPHORA RUDOLPHIANA Agardh. New York. 4-5.
173. CLADOPHORA GRACILIS Griffiths. New York-Maine. 4-12.
174. CLADOPHORA LÆTEVIRENS Dillwen. Coast. 3-8.
175. CLADOPHORA DIFFUSA (?) Harvey. New York. 6-12.
176. CLADOPHORA FRACTA Flora Danica. New Jersey-Massachusetts. 4-8.
177. CHÆTOMORPHA PIQUOTIANA Montagne. New Jersey and North. 12-16.
178. CHÆTOMORPHA MELAGONIUM Web. and Mohr. New York and North. 5-12.
179. CHÆTOMORPHA ÆREA Dillwen. New Jersey-Massachusetts. 3-12.
180. CHÆTOMORPHA OLNEYI Harvey. Rhode Island and Massachusetts. 3-10.
181. CHÆTOMORPHA LONGIARTICULATA Harvey. New England. 3-4.
182. CHÆTOMORPHA SUTORIA Berkeley. Connecticut. 3-8.
183. CHÆTOPHORA TORTUOSA Dillwen. Cape Cod and North. 3-4.
184. HORMOTRICHUM YOUNGANUM Dillwen. Cape May-Cape Cod. 1-3.
185. HORMOTRICHUM CARMICHÆLI Harvey. Boston and North. 1-3.
186. LYNGBYA MAJUSCULA Harvey. Whole Coast. 1-2.
187. LYNGBYA FERRUGINEA Agardh. Coast. 1-2.

188. LYNGBYA FULVA Harvey. Connecticut. 1-2.
189. LYNGBYA NIGRESCENS Harvey. New Jersey-Massachusetts. 1.
190. LYNGBYA CONFERVOIDES Agardh. South Carolina. 1-2.
191. LYNGBYA PUSILLA Harvey. South Carolina. ¼.
192. CALOTHRIX CONFERVICOLA Agardh. Coast. One-tenth.
193. CALOTHRIX SCOPULORUM Agardh. Coast. One-twentieth.
194. CALOTHRIX VIVIPARA Harvey. Long Island to Massachusetts. Three-tenths.

ADDITIONS.

Dr. W. G. Farlow in Professor Baird's "Report on Fish and Fisheries, 1873," gives the following additional species, localities, etc.: —

Ralfsia verrucosa Ag. Little Nahant — only known station in America.
Myriotrichia filiformis Griff. Point Judith.
Fucus distichus L. Marblehead.
Fucus furcatus L. Massachusetts Coast.
Melobesia polymorpha L. Robbinstown, Mass.
Melobesia membranacea Lam. Common along the coast on Zostera.
Melobesia pustulata Lam. On Fuci, Chondrus, etc. Coast of Massachusetts.
Hildenbrandtia rubra. Wood's Hole to New Haven.
Gymnogongrus Norvegicus Grev. Lynn Beach.
A slender species of Gracilaria supposed to be *G. confervoides* Grev. picked up on Long Island.
Chrysimenia (Chylocladia) rosea Harvey. Gay Head.
Callithamnion plumula Lyngby. Gay Head. Orient Point.
Chondria littoralis Ag. Wood's Hole, Mass. (Key West. Harvey.)
Dr. Farlow regards *Sargassum Montagnei* as a variety of *S. vulgare*, and thinks *Callithamnion Baileyi* a warm water variety of *C. tetragonum*.

ETYMOLOGY OF NAMES OF GENERA.

Agarum *Bory St. Vincent.* A Mushroom(?)
Ahnfeltia *Ag.* For Ahnfelt, a German botanist.
Alaria *Grev.* Winged.
Arthrocladia *Duby.* Jointed branch (in "Key" Arthocladia, by error).
Asperococcus *Hooker.* Rough-seeded.

Bangia *Lyngb.* For Hoffman Bang, a Danish botanist.
Bostrychia *Mont.* Ox-hair.
Bryopsis *Lam.* Moss-like.

Calliblepharis *Kütz.* Beautiful eye-lashes.
Callithamnion *Lyngb.* Beautiful little shrub.
Callophyllis *Kütz.* Beautiful leaf.
Calothrix *Ag.* Beautiful hair.
Ceramium *Roth.* A pitcher (but the fruit is not pitcher shaped).
Chætomorpha *Kütz.* Bristle-form.
Champia *Desv.* A personal name.
Chondria *Ag.* Cartilaginous.
Chondrus *Stackhouse.* Cartilage.
Chorda *Stackhouse.* A cord.
Chordaria *Agardh.* Cord-like.
Chrysymenia *Ag.* A golden membrane.
Chylocladia *Greville.* Juicy branched.
Cladophora *Kützing.* Branch-bearing.
Cladostephus *Ag.* Branch-crowned.
Codium *Stackhouse.* Skin of an animal.
Corallina *Linnæus.* A little coral.
Cordylecladia *Ag.* Cord-like branches(?)
Cystoclonium *Kütz.* Bladdery branches.

Dasya *Ag.* Hairy.
Delesseria *Lamouroux.* For Baron Delessert, a French botanist.
Desmarestia *Lam.* For Desmarest, a French naturalist.
Dictyosiphon *Lyngby.* Netted tube.

Ectocarpus *Lyngb.* External fruit.
Elachista *Duby.* Smallest.
Enteromorpha *Link.* Intestine-shaped.
Euthora *Ag.*

Fucus *L.* Greek—a sea-weed.
Furcellaria *Lam.* Forked.

Gelidium *Lam.* Ice-like or jelly-like.
Gigartina *Lam.* A grape-seed (from the shape of the tubercles).
Gloiosiphonia *Carmichael.* Viscid-tubed.
Gracilaria *Grev.* Slender.
Grateloupia *Ag.* For Dr. Grateloup, a French algologist.
Griffithsia *Ag.* For Mrs. Griffiths, "the most distinguished of British algologists."
Grinnellia *Harvey.* For Henry Grinnell, of New York.

Gymnogongrus *Martius*. Naked warts.

Halidrys *Lyngby*. Sea-oak.
Halosaccion *Kütz*. Sea-bag.
Halurus *Kütz*. Sea-tail (?)
Hildenbrandtia *Nardo*. For Hildenbrandt.
Hormotrichum *Kütz*. Necklace-hairs.
Hypnea *Lam*. From Hypnum, a genus of mosses.

Laminaria *Lam*. From lamina, a plate or blade.
Leathesia *Gray*. For G. R. Leathes, a British naturalist.
Lyngbya *Ag*. For Hans Christian Lyngby, a noted Danish algologist.

Melobesia *Lam*. Name of a sea-nymph.
Mesogloia *Ag*. Viscid pith.
Myrionema *Grev*. Myriad threads.
Myriotrichia *Harvey*. Myriad hairs.

Nemalion *Tozzetti*. A crop of threads.
Nitophyllum *Greville*. Shining leaf.
Nullipora *L*. Without pores.

Odonthalia *Lyngb*. Toothed-branch.
Oscillatoria *Vaucher*. Oscillating.

Peyssonelia *Decaisne*. For J. Peyssonel, an algologist.
Phyllophora *Grev*. Leaf-bearing.
Plocamium *Lam*. Braided-hair.
Polyides *Ag*. Many-formed.
Polysiphonia *Grev*. Many-tubed.
Porphyra *Ag*. Purple.
Ptilota *Ag*. Pinnated.
Punctaria *Grev*. Dotted.

Ralfsia *Berkeley*. For John Ralfs, an English diatomist.
Rhodomela *Ag*. Red-black.
Rhodymenia *Grev*. A red membrane.

Sargassum *Rumph*. Sargazo in Spanish.
Scinaia *Bivona*.
Seirospora *Harvey*. Chain-seeds.
Solieria *Ag*. For Solière, a French algologist.
Sphacelaria *Lyngb*. Gangrened (from the withered fruiting tips).
Spyridia *Harvey*. Basket-like.
Stilophora *Ag*. Dot-bearing.
Striaria *Grev*. Striated.

Ulva *Linn*. Ul—water in Celtic.

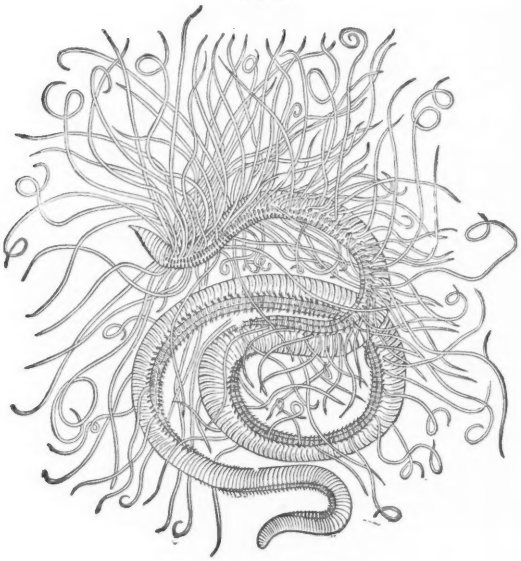
Vaucheria *De Candolle*. For Vaucher, a Swiss confervologist.

REVIEWS AND BOOK NOTICES.

THE UNITED STATES FISH COMMISSION REPORT.*—The valuable report of Prof. Baird, with the supplementary papers by Profs. Verrill, Gill, Smith and others, is not only a readable but exceedingly handy work for reference. How manifold are the subjects relating to a proper inquiry into the food and habits of our fishes may be gathered from the pages of this report. Not only have we full data concerning the practical questions relating to the fisheries, but Prof. Baird has called to his aid a number of naturalists, chemists and physicists, all whose investigations bear on the subject of our fisheries, the most abstruse matters having an immediate practical interest. It was thus found necessary to study the peculiarities in the temperature of the water at different depths, its chemical constitution, the percentage of carbonic acid gas and ordinary air, its currents, etc., besides thorough investigations with the dredge. The report relating exclusively to the fisheries occupies 280 pages of the volume, and is accompanied by woodcuts, diagrams, and a map designed to show more particularly the dis-

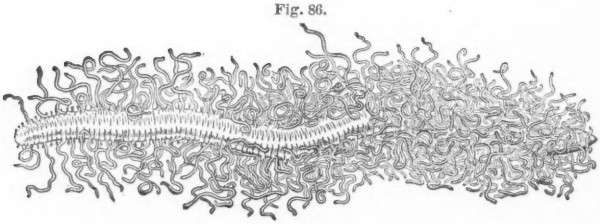
* United States Commission of Fish and Fisheries. Part I. Report on the Condition of the Sea Fisheries of the South Coast of New England in 1871 and 1872. By Spencer F. Baird, Commissioner. With Supplementary Papers. Washington, 1873. 8vo. pp. 852, with a map and 40 plates. Verrill's Report separate. Naturalists' Agency. $3.00.

Fig. 85.



Cirrhatulus grandis, living.

Fig. 86.

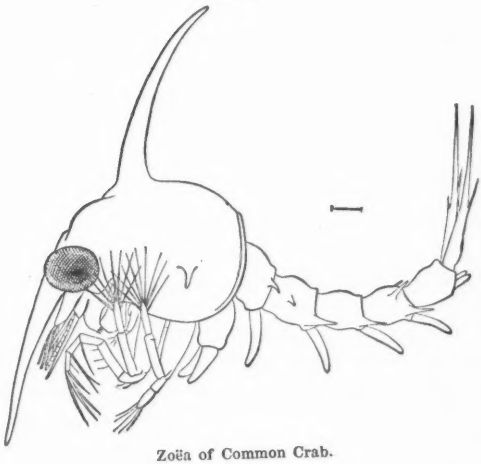


Cirrhatulus, dead.

Fig. 87.

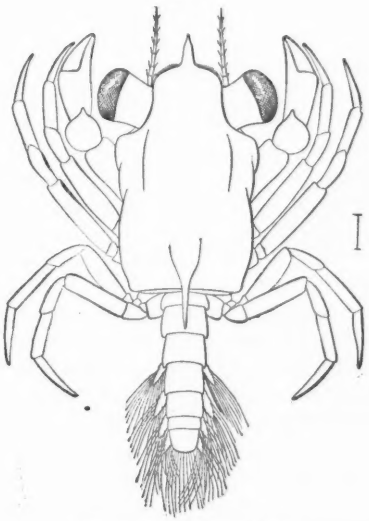
Clymenella.

Fig. 89.



Zoëa of Common Crab.

Fig. 90.



Megalops of Common Crab.

tribution of animal life along the coast of Rhode Island and Massachusetts south of Cape Cod.

The report is also accompanied by a "List of the Sea Weeds of the South Coast of New England," by Dr. W. G. Farlow; a "Report upon the Invertebrate Animals of Vineyard Sound and the Adjacent Waters, with an Account of the Physical Characters of the Region," by Prof. A. E. Verrill, and a "Catalogue of the Fishes of the East Coast of North America," by Dr. Theodore Gill.

We shall concern ourselves chiefly with the admirable report of Prof. Verrill, which we would commend to our readers as a full and reliable manual of the marine zoology of our southern New England shore. It is illustrated by thirty-eight plates containing 287 figures (mostly drawn from life by Mr. Emerton) of the invertebrate animals, a few of them illustrating early stages of the crustacea. As an evidence of the thorough and detailed manner in which the subject is discussed, we may cite the chapters into which the work is divided:—Fauna of the Bays and Sounds; Fauna of the Brackish Waters of Estuaries, Harbors, etc.; Fauna of the Colder Waters of the Ocean Shores and Outer Banks and Channels; Lists of Species found in the Stomachs of Fishes; Habits and Metamorphoses of the Lobster and other Crustacea; Systematic Catalogue of the Invertebrates of Southern New England and Adjacent Waters. Under these heads will be found many remarks on the habits of the lower animals, which add much to the popular interest and value of the book.

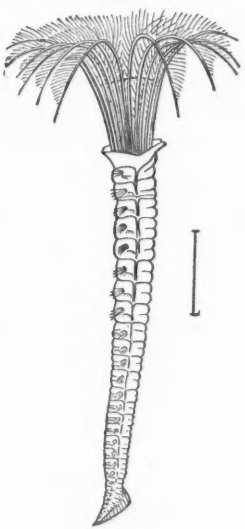
A good many new forms are described and figured from life, mostly by Mr. Emerton, particularly among the worms and crustacea, and in the work of identifying and describing the latter, the author has been aided by Messrs. S. I. Smith and O. Harger. As samples of the illustrations, which are simple outlines by the Jewett process, we offer the following figures kindly loaned by the author. Fig. 84, *Lerneonema radiata* Stp. and Lüt., a copepod parasitic on the menhaden. Fig. 85 represents the *Cirrhatulus grandis* in a living state, and 86 the same from a specimen preserved in alcohol; Fig. 87, *Clymenella torquata*, Fig. 88, *Euchone elegans*.

We have in the July NATURALIST referred to the early history of the lobster described by Mr. Smith, and now reproduce his figures of the zoëa of the common crab (*Cancer irroratus*, Fig. 89, en-

larged seventeen diams.) as seen in the last stage just before it changes to the "megalops" stage (Fig. 90, enlarged thirteen diams.).

We shall look forward with much interest to the next year's report on the work done by the Fish Commission on the coast of

Fig. 88.



Euchone.

Fig. 84.

Lerneonema.

Maine, preliminary notices of which have already appeared in the "American Journal of Science," the "Proceedings of the American Association" and this journal.

North American Flies.*—The long expected third volume of this series (the fourth was issued in 1869) has at length appeared. It contains elaborate monographs of two families of diptera entitled:—1. The family of Ortalidæ; 2. Review of the North American Trypetina.

The Ortalidæ are treated in the most exhaustive manner and the views about their classification, given in a long introductory

* Monographs of the Diptera of North America, Volume iii, prepared for the Smithsonian Institution, by H. Loew, Washington, 1873, 8vo, pp. 351.

chapter (pp. 1–70), embrace all the Ortalidæ at present known from all parts of the world. The existing literature of the Ortalidæ is also fully reviewed. The number of the North American species of this family described in the body of the work is sixty-six.

The North American Trypetidæ have been the subject of a monograph which appeared in the first volume of the same series (1860). The additions to this family, received by Mr. Loew since that publication, were so numerous that he thought it worth while to return to the same subject again. The present work contains the descriptions of sixty-one North American Trypetidæ, thirty-eight of which were not contained in his first monograph. To this are added twelve South American species, for the sake of comparison with closely allied North American ones.

To the volume are added four plates, with 116 figures, representing the wings of nearly all the described species.

The translation of the volume from the German manuscript was made by Baron R. Osten Sacken. The four volumes of the *Monographs*, etc., hitherto published, contain the following families of Diptera: Large monographs; Dolichopodidæ (Vol. II), Tipulidæ brevipalpi (Vol. IV), Ortalidæ (Vol. III), Trypetidæ (Vols. I and III). Smaller monographs (all in Vol. I): Sciomyzidæ, Ephydridæ, Cecidomyidæ.

THE UNICELLULAR NATURE OF THE INFUSORIA.* — Anything that comes from the pen of the distinguished professor of Jena is striking and original. The main idea of the present paper is a reaffirmation of the unicellular nature of the Infusoria, first distinctly enunciated by Von Siebold in 1845, when he opposed Ehrenberg's well known conceptions of their organization. Hæckel divides the animal kingdom into two groups, the one-celled or Protozoa, and the many-celled or Metazoa, and accompanies his views with the inevitable phylogenetic table of the animal kingdom.

This view scarcely seems in accordance with known facts regarding the structure of these so-called unicellular infusoria. If the reader will turn to that remarkable book, "Mind and Nature" (p. 43) by the late Professor H. J. Clark, he will find the many-

* Zur Morphologie der Infusorien; von Ernst Hæckel. From the Jena Zeitschrift. Bd. vii. Leipzig, 1873. 8vo, pp. 54, with two plates.

celled structure of Actinophrys clearly described and figured. He remarks that "though the cells are very distinct, they exhibit a low state of development, as low perhaps as could possibly obtain without failing to be genuine cells." Farther on (p. 46) he claims that in this animal there are "two distinct sets of tissues," and speaks of an "outer layer of cells" and of a set of "inner cells." Until these parts are explained away we shall doubt the wisdom of the conclusions of the German observer, and call in question the naturalness of his classification of the animal kingdom into one-celled and many-celled animals. It seems less natural than the old division into vertebrates and invertebrates.

Siebold's Anatomy of the Invertebrates.* — We have constantly used this work, having found it the most valuable book of reference in the language, notwithstanding the fact that it is twenty years behind the times, and the classification is objectionable. This edition is exactly the same as that of 1854.

BOTANY.

Dr. Beardslee has recently published a catalogue of the plants of Ohio, in the preface of which he speaks of "the late M. S. Bebb, of Illinois." As inquiries are already addressed to us upon the subject, we wish to say that Mr. Bebb actually and actively lives, and we hope the day is far distant when this appellation can be rightfully appended to the name of this most enterprising and efficient of our middle-aged western botanists. — A. G.

Double Thalictrum. — A day or two ago, Mr. Whiting, a student, brought me a novelty in the shape of a completely doubled flower of *Thalictrum anemonoides*. The stamens were *all* transformed to pink petals, giving to the flower much the appearance of a small specimen of the double flowered form of *Prunus nana*. There was but one flower, on a solitary pedicel, otherwise the plant seemed to be normal. I shall secure the root if possible, and hope to perpetuate this very pretty sport. Is this doubled pink form common? — C. E. Bessey.

Dr. W. G. Farlow, a valued contributor to the Naturalist, has returned to Cambridge, after two years' study of lower crypt-

*Anatomy of the Invertebrata. By C. Th. von Siebold. Translated from the German with additions and notes by Waldo I. Burnett, M.D. Boston, 1874. James Campbell. 8vo, pp. 470. $5.00.

ogamic botany with DeBary of Strasburg, Müller of Geneva, and Thuret of Antibes. Through the month of August he takes charge of the summer botanical instruction at the Botanic Garden of Harvard University, which is for this month devoted to cryptogamic botany exclusively, mainly to Fungi and Algæ. We understand that he is engaged in the preparation of a manual of our New England Marine Algæ, which, for a beginner, is very much needed.

ZOOLOGY.

NEW SPECIES OF NORTH AMERICAN BIRD. — On investigation of the interesting sandpiper from the Prybelov Islands, lately mentioned by Mr. Dall in the NATURALIST (vii, 1873, 634) as *Tringa "crassirostris,"* and given under this name in my "Check List" (No. 426 *bis* upon Mr. Harting's identification, I found that the bird is not *T. crassirostris* but an apparently new species, which, in my late appendix to H. W. Elliott's Report on the Prybelov Islands (1873), I have named *Tringa ptilocnemis.* As the work just mentioned is not generally accessible, owing to the smallness of the edition, the following is reproduced in substance: —

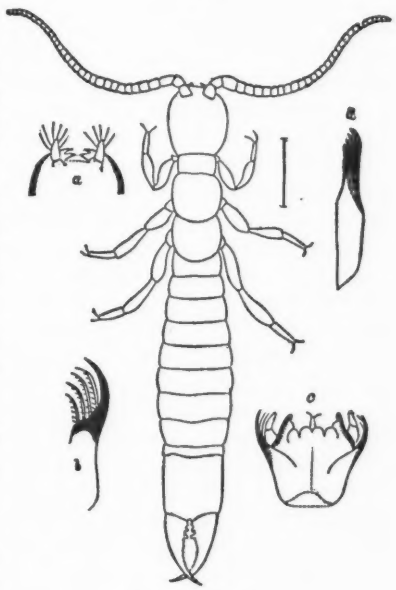
Adult in breeding plumage. With somewhat the general appearance of *Tringa alpina,* but the black areas on the under parts pectoral, not abdominal. . . . Legs very short (much as in *T. maritima*); tibial feathers reaching nearly or quite to the suffrago. Tarsus shorter than the bill, or than the middle toe and claw. . . . A coronal area, upper back, interscapular region and scapulars black, completely variegated with rich chestnut-brown, paler ochrey-brown and whitish; the body of each feather being black with one or another or all of these various edgings; the coronal separated from the interscapular markings by a grayish-white, dusky-streaked, cervical interval. Lower back, rump and upper tail coverts blackish-brown, only varied with an occasional chestnut-edged feather. Wing coverts grayish-brown with narrow white edging, the greater ones with broad definitely white tips. Secondaries nearly all pure white, a few of the outermost and innermost also, with grayish-brown touches near the end. Primaries grayish brown with white shafts, except at tip, and fading to white on the inner webs toward the base; several of the innermost also largely white on the outer web, with definite white tipping. Central tail feathers brownish-black; next pair abruptly paler, grayish; rest white or nearly so, with a faint gray tint. Front and sides of head, supraciliary line, tufts of flank feathers and entire under parts white, interrupted on the breast with a large but not perfectly continuous nor well-defined black area, and marked on the upper breast and sides with a few narrow sharp blackish shaft lines. A dusky auricular patch. Legs and bill dark. Length about 9·50 inches; wing,

about 5; tail, 2½; bill, 1·10 to 1·40; tarsus, 0·90 to 1·00; middle toe and claw 1.05 to 1.20.

The other plumages, a series of measurements, general discussion and description of eggs, with biographical notes by Mr. Elliott, will be found in his report. — ELLIOTT COUES.

OCCURRENCE OF JAPYX IN THE UNITED STATES. — While engaged at the end of April in exploring the Mammoth Cave and adjoining caverns with Prof. Shaler of the Kentucky Geological Survey, I detected under a stone in a small cave a few rods north of White's Cave (which may be called White's Cave, Jr.) and from 40 to 50 feet from the mouth, consequently in partial daylight, a specimen of Japyx in company with two *Scolopendrella Americana* Packard, our most interesting myriopod, and not hitherto found except in Salem, Massachusetts. I afterward found several of the Japyx under stones by the roadside near Mammoth Cave. It here occurred, just as I have found the European *J. solifugus* near Vienna, in company with my friend Dr. Brauer. Our species differs decidedly from the European species, with specimens of which I have compared it (see Fig. 91, and details of mouth-parts). It is quite different from the Mexican *J. Saussurii* of Humbert from Santa Cruz and Orizaba.

Fig. 91.



Japyx solifugus.

Japyx subterraneus, as this new species may be called, may at once be distinguished from the other species by the much greater

length of the abdomen, the head and thorax taken together being more than twice contained in the abdomen, while in *J. Saussurii* they are two-thirds as long as the abdomen. The 8th abdominal segment, also, is nearly twice as long as in the Mexican species. The head is broader than in *J. Saussurii*, but narrower and pointed a little more than in *J. solifugus*. The forceps are much nearer *J. solifugus* than the Mexican species, and is much longer than in either species. Length ·58 inch; the Mexican specimen measured about an inch. It is whitish, with the two terminal segments honey yellow; the forceps much darker. We shall in a succeeding number figure this interesting form, which is of extraordinary interest, as it is an ally of Campodea, now regarded as a stem-form of the higher insects by Brauer, Lubbock and others.—A. S. Packard, Jr.

The "Hateful" Grasshopper in New England.—Though the ravages by grasshoppers in New England are caused by the red-legged locust (*Caloptenus femur-rubrum*), it seems that for several years there have been specimens of *Caloptenus spretus* from Maine and Massachusetts in the Museum of the Peabody Academy of Science. They have been hitherto confounded with *C. femur-rubrum*, but are at once distinguishable by the shorter male cerci and the notched terminal ventral segment. The interesting fact about these eastern *C. spretus* is, that they are of precisely the same size and markings of *C. femur-rubrum*, being much smaller and with much shorter wings than the western race, a difference I believe due almost wholly to climatic causes. A number of surmises regarding sexual and natural selection and mimicry might be indulged in, but the facts that might suggest them can be explained by a reference to the different meteorological conditions by which the two races are environed. In Dr. Hayden's forthcoming "Annual Report on the Geology of Colorado," the reader will find a number of facts bearing on the variation in size of body, and form of wings and color in eastern and western examples of the same species of moths, the conclusions from which are borne out by a study of these grasshoppers.—A. S. Packard, Jr.

The Kinglets in New Jersey.—If your correspondent, Dr. Abbott, had only been aware that it has been our aim throughout our "History of North American Birds," to state nothing as *known* which is only *surmised* there would have been no occasion for any "surprise" on his part, that our account of the Reguli has been

made to conform to this rule. It is never safe to infer from the mere presence of a bird in any particular locality in the breeding season that it necessarily breeds there. I could give you instances without number where birds are found in summer in localities, where, so far as one can ever be sure of a negative, we know they do not breed. We have seen the black-poll warbler in eastern Massachusetts as late as the 10th of June. Yet who supposes it ever breeds here? Dr. Abbott's account escaped my notice, but I certainly could not have made it the occasion of any change in my statement that the Regulus was not then *known* to breed in the United States. I could only have referred to the interesting fact of its occurrence, as stated, as suggestive of its possibility. Nothing short of its actual nest and eggs would have justified me in speaking of its breeding as a certainty. — THOMAS M. BREWER.

ZOOLOGY IN BELGIUM. — The Belgium Academy has lately issued two large octavo volumes, as memorials of its hundredth anniversary. The second volume is of great interest to zoologists as it contains a review of the progress of zoology in Belgium, by the veteran naturalist Prof. P. J. Beneden.

GEOLOGY.

SMALL SIZE OF THE BRAIN IN TERTIARY MAMMALS. — At the last meeting of the Connecticut Academy of Arts and Sciences, June 17th, Prof. Marsh made a communication on the size of the brain in Tertiary Mammals. His researches on this subject have been mainly confined to the larger extinct mammals which he had obtained in the Rocky Mountain region, and the results are of peculiar interest. The Eocene mammals all appear to have had small brains, and in some of them the brain cavity was hardly more capacious than in the higher reptiles. The largest Eocene mammals are the *Dinocerata*, which were but little inferior to the elephant in bulk. In *Dinoceras* Marsh, the type genus, the brain cavity is not more than one-eighth the average size of that in existing Rhinoceroses. In the other genera of this order, *Tinoceras* Marsh and *Uintatherium* Leidy, the smallness of the brain was quite as remarkable. The gigantic mammals of the American Miocene are the *Brontotheridæ*, which equalled the *Dinocerata* in size. In *Brontotherium* Marsh, the only genus of the family in which the skull is known, the brain cavity is very much larger than in the

Eocene *Dinoceras*, being about the size of the brain in the Indian Rhinoceros. In the Pliocene strata of the West, a species of Mastodon is the largest mammal, and although but little superior in absolute size to Brontotherium, it had a very much larger brain, but not equal to that of existing Proboscidians. The Tapiroid ungulates of the Eocene had small brain cavities, much smaller than their allies, the Miocene *Rhinocerotidæ*. The Pliocene representatives of the latter group had well developed brains, but proportionally smaller than living species. A similar progression in brain capacity seems to be well marked in the equine mammals, especially from the Eocene *Orohippus*, through *Miohippus* and *Anchitherium* of the Miocene, *Pliohippus* and *Hipparion* of the Pliocene, to the recent *Equus*. In other groups of mammals, likewise, so far as observed, the size of the brain shows a corresponding increase in the successive subdivisions of the Tertiary. These facts have a very important bearing on the evolution of mammals, and open an interesting field for further investigation.

Deep Sea Soundings. — The "Tuscarora," Commander Belknap, duly reached Honolulu from San Diego, California, having been engaged in taking deep-sea soundings. She made a straight passage, not deviating twenty miles on either side of a direct line drawn between the two ports. During the passage sixty-two soundings were made, at a distance of forty miles apart. The deepest sounding — the forty-ninth after leaving the coast — was found to be 3,054 fathoms, while the mean depth was 2,562 fathoms. At a distance of 600 miles from the American coast the depth was found to be 494 fathoms, and at 1,050 miles, 780 fathoms. The average temperature below 1,200 fathoms was found to be about thirty-five degrees Fahrenheit. From Honolulu to Japan sixty casts were taken at intervals of about 50 miles. In the first 95 miles from Honolulu, the depth increased at nearly 162 ft. to a mile, reaching 2,418 fathoms in lat. 21° N., long. 159° 20′ W. The average depth of all the casts taken during this voyage was 2,450 fathoms. Between the mountains (all but one of which are entirely submarine) the bed of the ocean was very level; the greatest depth was found at lat. 22° 44′ N., long. 168° 23′ E., 3,262 fathoms.

Bottom temperatures, as in other parts of the Pacific, range from 33°·2 F. to 34°·6 below 1,800 fathoms, whatever the addi-

tional depth. Between 1,200 and 1,800 fathoms the temperature rises slowly to about 35° at the former depth. From 1,200 fathoms to the surface the thermometer rose steadily; surface temperatures ranging from 70° to 76° F.

The voyage occupied twenty-eight days, and the weather was exceptionably favorable. There are only sixty-five inhabitants on Peele Island, and the "Tuscarora" was the first visit of a naval vessel for more than seventeen years; Commodore Perry stopped at the island in 1853.

ANTHROPOLOGY.

TROGLODYTES IN ALASKA.—In 1872, Mr. William H. Dall made some interesting discoveries of prehistoric remains in a cave on Amaknak Island, situated in Captain's Bay, Oonalaska, which he supposed exhausted the subject. In 1873, however, he found that he had left undisturbed a still lower stratum, and finally cleaned out the entire cave down to the bed rock. He ascertained that the whole interior of the cave had been painted over with a red pigment or chalky ore of iron, above which was a bed of organic mould about two feet in its greatest depth, in which were found three skeletons, surrounded by a rough sort of sarcophagus built of the jaws and ribs of whales, and around them were a large number of implements, especially of stone knives. This was covered in turn by a layer six inches or less in thickness of refuse material, the remains of repasts on marine animals, shell-fish, fish, and echini. Scattered irregularly over this were broken and worn implements of quite a different character from those found with the dead, and the whole indicated that this was only a resting-place of parties who used it temporarily while waiting an opportunity to cross the surf to the adjacent island. It was down to this lower stratum that the labors of the previous season had extended but without disturbing it.

A stratum of this latter portion was covered by a bed of shingle, evidently introduced by water, and supposed to be the actual bottom of the deposit. Mr. Dall is of the opinion that the skeletons found here are the oldest yet discovered in the Aleutian region, although not approaching in antiquity those discovered on Table Mountain, or the Neanderthal. He thinks the cave was first used as a burial-place, the mould over three skeletons having

accumulated by the decay of animal matter and of rubbish; and that the débris from the repasts of occasional visitors had been gathering for a great many years. An unusually high tide or storm probably brought in the shingle from the adjacent sea-beach, and after this the cave was again used as a deposit for the dead. Nothing was discovered indicating in any way that the place had been used or visited by the white races.

The total number of crania obtained by Mr. Dall amounted to thirty-six, besides many hundred implements of bone, ivory, and stone, and many carvings of wood and other objects, presenting evidence of the existence of large and flourishing communities numbering thousands of inhabitants where now none or only remnants of population exist.

Underneath the old villages were found still more ancient kitchen heaps of echini, fish bones, and edible shell-fish many feet in thickness, the age and time taken in forming them hardly to be approximated or counted even in centuries. Only in the upper strata were seen the indications of progress in hunting and fishing, afterward so notable that even the sperm whale succumbed to the attacks of these hardy canoe-men. Their progenitors were content to pick echini from the shore and mussels from the rocks, and hardly any implements could be found in the refuse of their repasts — the accumulation of centuries.

After them large villages of solidly constructed houses rose; and probably at the height of their progress and numerical increase the almost equally barbarous Russian of Siberia fell upon them, and nearly swept them from the face of the earth.—*Harpers' Weekly.*

Egyptian Archæology. — At the meeting of the Anthropological Institute, June 9, Prof. Busk, F. R. S., president, in the chair, Sir John Lubbock, Bart., read a paper on the discovery of stone implements in Egypt. The author began with a sketch of the writings and opinions of M. Arcelin and Dr. Hamy, who maintained that the flint implements found along the valley of the Nile, including a hatchet of the St. Acheul type at Deir-el-Bahari, indicated the existence formerly of a true stone age there as in Western Europe. MM. Mortillet and Broca concurred in that view. On the other hand Dr. Pruner-Bey, and especially Dr. Lepsius, had expressed the opinion that most of the objects de-

scribed, such as the flint flakes, were naturally produced. M. Chabas also took the same view as Dr. Lepsius, and denied the existence of any evidence of a stone age in Egypt or elsewhere. On the occasion of a late visit to Egypt with the object of getting conclusive personal evidence on the question, the author found worked flints at various spots along the Nile Valley, especially in the valley of the tombs of the kings of Thebes, and at Abydos, and after carefully weighing the facts and arguments brought forward by MM. Lepsius and Chabas, he was disposed to agree with MM. Arcelin and Hamy in considering that these flint implements really belonged to the stone age, and were ante-Pharaonic. Sir John exhibited a full series of the Egyptian flint implements found by himself during his visit, and the paper concluded with a minute description of each specimen. Prof. Owen, F. R. S., then read a paper on the ethnology of Egypt. Since the observations recorded in 1861, by Dr. Pruner-Bey, on the race-characters of the ancient Egyptians, mainly based on the characters of skulls, evidences, in the author's opinion, of a more instructive kind have been discovered, chiefly by M. Mariette-Bey. They consist of portrait-sculptures, chiefly statues, found in tombs accompanied by hieroglyphic inscriptions revealing the name, condition, and date of decease. A study of those works led to the conclusion that three distinct types were indicated. (1) The primal Egyptian, bearing no trace of negro or Arab, but more nearly matched by a high European facies of the present day. (2) The type of the conquering race of Shepherd Kings, or Syro-Arabian, exemplified in the Assyrian sculptures. (3) The Nubian Egyptian, typified in the bas-relief figure of Cleopatra in the Temple of Denderah. In conclusion, the professor drew a graphic picture of the high state of civilization attained by the Primal Egyptian race, whose exquisite works, done six thousand years ago, are now rendered accessible to man. The paper was amply illustrated by a series of photographs, maps and diagrams. — *Nature.*

MICROSCOPY.

Improvements in Insect Mounting. — The lesson of the fly in amber was one which took us a long time to learn, or rather which we never learned well until, now, its whole secret comes to us from India. Mr. Staniforth Green, of Ceylon, has sent a collec-

tion of mounted insects to London, which have been presented to the Queckett club by Mr. Curties. They are represented by Messrs. Curties, Ingpen, Loy, McIntire and others as well preserved and satisfactory objects, free from cloudiness, air bubbles, or deterioration of tissue as well as from distortion of form. Not being flattened or eviscerated, they show to great advantage in the binocular microscope. A few had been soaked in potash solution, but these were the least satisfactory members of the collection. The largest and best part of the objects had been immersed in the medium without maceration or other preparation. The smaller insects were simply killed by immersion in ether and immediately transferred to the soft balsam; the larger insects were similarly killed in ether, then dried a few days under slight pressure between the leaves of a book, and afterward soaked in turpentine and transferred from that to balsam. The balsam containing the insects was kept in the tropical sun for some time, until all moisture was dissipated and the balsam had pervaded the whole of the tissues. The muscles and other internal and external organs, not having been disorganized by potash or in any other way, were well preserved and capable of inspection; and in many cases polarized well. Small delicate insects which are difficult of preservation or even of study in any other way, are most successful in this; as, for instance, aphides, small and frail diptera, hymenoptera, minute spiders, eggs, larva, pupa, etc. This method is of value not only to the microscopist, but also to the entomologist, placing rare or frail specimens out of reach of dust, mould, ants, and other dangers which threaten dried specimens.

We have tried this method largely, both with thin balsam, and with hard balsam dissolved in chloroform and in benzol, and have succeeded with all. Probably experience will show that each is best adapted to certain objects. A water-bath is a good substitute for the tropical sun. When the balsam is sufficiently hard the objects should be mounted in it in glass cells. Doubtless the sand-blast cells will prove to be adapted to this purpose.

Measuring Angular Aperture. — Mr. Wenham, in order to gain accuracy in measuring the angular aperture of dry objectives, would like to cut off all stray light that might enter the lens without being capable of forming an image, by placing over the objective a conical nozzle having a small aperture in its apex. This

aperture would correspond to the focus of the lens, and the nozzle would just include the cone of rays capable of forming an image and would exclude all false rays of any considerable angle. This method would be inconvenient, however, and as the angle is measured by a horizontal movement a vertical slit will be a satisfactory substitute. For high powers the slit must have thin edges; and it must be capable of adjustment to the width of focus of the lens. His arrangement is easily made and used. A plate three inches long and one inch wide has a central aperture nearly one-half inch wide, the edges of this opening being bevelled away below so as to admit a large angle of light. Upon this plate lies a glass slip about 2 in.$\times\frac{1}{2}$ in., pressed against at one end by a spring, and at the other end by a screw, so that it can be easily slid backwards and forwards under the two staples (one inch apart) which hold it upon the surface of the plate. The slip is formed by the edges of two slips of platinum foil (·001 thick) one of which is cemented with Canada balsam upon the glass slip, while the other is fastened under one of the staples so as to lie on the glass slip but not move with it. These platinum slips never overlap; but their edges may be brought in contact, or may be separated as widely as desired by means of the set-screw pressing against one end of the glass slip which carries one of them. In measuring angles the usual method of rotating the instrument horizontally is employed; only this apparatus lies upon the stage with its slit in focus of the objective and adjusted in width so as barely to include the whole breadth of the focus. If the stage of the microscope is too thick to admit full angle of light, the apparatus may be arranged below the stage and the objective focussed down to it.

Cataloguing Microscopic Specimens. — At the Medical Microscopical Society, a paper by Mr. Groves was read on the subject of cataloguing and arranging microscopic specimens. Though classification was deemed necessary in large cabinets, yet it was considered entirely undesirable in small ones, and in both cases the catalogue and not the arrangement was relied upon for finding objects. The method of cataloguing recommended consists of an ordinary alphabeted note book in which, under the proper alphabetical heading, every portion of each specimen is independently entered and the slide referred to by numbers or otherwise. Thus one excellent slide which shows well a number of points of struct-

ure will be entered under several headings and be used to illustrate all these points, while under the usual methods of classifying slides in series, a number of duplicate slides would be required to fill up the different series. All difficulty in finding specimens is also positively obviated.

The president, Mr. Jabez Hogg, expressed the belief that the proposed plan would supersede all others now in use.

Sand-blast Cells. — Mr. Henry F. Hailes contributed to the Queckett Club an account of a new and probably valuable application of the sand-blast process. It had occurred to him that this process might be employed to sink cells in glass slips for microscopical mounting; and he applied to the inventor, Gen. Tilghman, who had a supply sunk in an apparently satisfactory manner. Mr. C. Baker, the optician of High Holborn, has undertaken to supply these new cells to the trade. They can be sunk of any desired size and shape, and possess the positive advantage of having no joint at the bottom of the cell. Of course the floor and sides of the cell are rough or "ground" surfaces, but this is not a serious disadvantage. For opaque objects the ground surface forms an agreeable background; for objects in balsam, the refractive index of the medium corresponds so nearly with that of glass that the granulations of the glass surface are optically obliterated and disappear entirely; for media of less refractive power than balsam, it is necessary to varnish first the ground surface with balsam and allow it to dry before introducing the fluid. The new cells seem particularly available for foraminifera, insects mounted without flattening, and other clumsy specimens, whether in air or balsam or glycerine.

Another Microscopical Cement. — Mr. T. Charters White recommended to the Queckett Club four or five parts of common yellow beeswax melted with one part of Canada balsam for this purpose. Like the electrical cement, and the paraffine, which have already come into general use for the same purpose, it is applied melted, on a hot wire, after the manner of soldering; sets as soon as cool, and hence cannot run in under the cover however thin the cell may be, and can be instantly loosened by warming if the cell is to be repaired or the object dismounted for any purpose. It is especially applicable to dry mounting, to temporarily fixing objects for early use, and to fasten apparatus where contrivances, as

growing cells, etc., are extemporized for immediate use and without care as to their durability.

NEW APPLICATION OF STAINING TO PATHOLOGY.—Dr. H. C. Major claims that healthy and morbid tissues are affected by logwood staining-fluid—with such different degrees of facility as to afford a really valuable means of discrimination. Thus staining becomes a means of diagnosis as well as of defining the structure of cells, etc. He instances sections of brain in cases of acute mania and of senile atrophy, in the former the gray cortical layer and in the latter the internal white substance being most deeply stained and best defined.

NOTES.

THE governor of Minnesota calls on the general government for aid. as owing to the ravages of the grasshoppers for two years past "many thousands are now (July 8) suffering for food." An "utter and wide-spread destitution exists in the southwestern counties of this state among the new settlers, whose crops have been destroyed for two years." He asks for contributions of money and provisions to relieve the immediate necessities of the sufferers. Why should not the grasshopper be eaten in turn? The grasshopper or locust of the east is universally eaten in portions of Africa and western Asia, and pronounced a nutritious and palatable article of diet by Arab chiefs as well as Hottentot savages. They are eaten roasted whole, minus the legs, or roasted and powdered. We would recommend that experiments be made as to the best mode of preparing the locust for food. They should be thoroughly cooked to guard against parasitic worms. Not willing to urge the use of grasshoppers as food for others without first eating them ourselves, we may say that we have found the grasshopper, first killed by boiling water, and then fried in butter, at least as palatable as many articles of food eaten by civilized people; and to people actually famishing, as is said to be the case in Minnesota, it will be worth their while to avail themselves of a food stuff which millions perhaps of people of other lands regard as wholesome.

THE Proceedings of the 22d, or Portland meeting of the American Association make a much more bulky volume than any of its predecessors. It is noticeable that while the papers in the section

of Mathematics, Physics and Chemistry, occupy perhaps no more space than usual, those in Natural History fill 409 pages. The papers are perhaps up to the average, but we notice two or three that might have been weeded out by the publishing committee. The volume appears with a commendable degree of promptness.

Mr. G. R. CROTCH of England, known for his studies on the Coleoptera, died the last of June at Philadelphia, of consumption. He was the author of several valuable papers on Coleoptera and an indefatigable collector. He lately spent a year in California and Vancouver Island and adjacent regions, making extensive collections, mostly contained in the Museum of Comparative Zoology.

BOOKS RECEIVED.

Observations on the genus Unio; with Descriptions of New Species, and Descriptions of Embryonic forms and soft Parts. Also New species of Strepomatidæ and Limnæidæ. By Isaac Lea, Philadelphia, 1874. 22 plates. pp. 74. 4to.

Proceedings of the Academy of Natural Sciences of Philadelphia. Part I. Jan.-March, 1874, plates, pp. 72. 8vo.

Bulletin Mensuel de la Societe d'Acclimatation. Paris. Fevrier, 1874. 8vo. pp. 97-160.

Seventh Annual Report of the Provost to the Trustees of the Peabody Institute of the City of Baltimore, 1874: 8vo. pp. 45.

The Second Annual Report of the Board of Managers of the Zoological Society of Philadelphia 1874. With plates. 8vo. pp. 32.

Transmission of Disease. First Paper, Consumption. By A. C. Hamlin, of Bangor, 1874. pp. 9. 8vo.

Transfusion. By A. C. Hamlin, of Bangor, 1874. pp. 14. 8vo.

Annotated List of Birds of Utah. By H. W. Henshaw. Salem, 1874.

Proceedings of the Royal Society of Edinburgh. For 1872-73. Vol. viii, No. 85. pp. 206. 8vo.

The Principles of Science. By W. Stanley Jevons. MacMillan and Co., New York, 1874. With plate. pp. 487. 8vo. Price 5.00.

Proceedings of the Boston Society of Natural History. 1874. Vol. xvi. Part iii. pp. 209-320. 8vo.

Notes on the Mammals of Portions of Kansas, Colorado, Wyoming and Utah. By J. A. Allen. Salem, 1874. pp. 43-60. 8vo.

Metamorphism Produced by the Burning of Lignite Beds in Dakota and Montana. By J. A. Allen. Boston, 1874. pp. 19. 8vo.

Geographical Variation in Color among North American Squirrels. By J. A. Allen. Boston, 1874. pp. 21. 8vo.

Geographical Variation in North American Birds. By J. A. Allen. Boston, 1872. pp. 10. 8vo.

Papers, Chiefly Anatomical. Presented at the Portland Meeting of the American Association for the Advancement of Science, August, 1873. By Burt G. Wilder. Salem, 1874. pp. 211-308. 8vo. With plates.

Bulletin of the Buffalo Society of Natural Sciences. Warren, Johnson and Co., Printers. Vol. ii. No. 1, 1874. pp. 104. 8vo. With a plate.

Monthly Report of the Department of Agriculture for June, 1874. Washington. pp. 245-285. 8vo.

Verhandlungen der kaiserlich-koniglichen Zoologisch-botanischen Gesellschaft in Wien. Band xxiii. Wien, 1874. pp. 740. 8vo. With plate and photograph.

Abhandlungen herausgegeben vom naturwissenschaftlichen Vereine zu Bremen. Band iii, (Schluss) Heft iv. Band 4, Heft 1. C. Ed. Muller, Bremen. 1873-1874. 8vo.

Tabellen uber den Flacheninhalt des Bremischen Staats, den Waeserstand der Weser und die Witterungsverhaltnisse des Jahres 1872. Beilage No. 3, zu den Abhandlungen des naturwissenschaftlichen Verein zu Bremen. C. Ed. Muller, Bremen, 1873. 4to.

Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Classe. Band lxvii, Abtheil ii, Heft iv und v, Abtheil iii, Heft i to v. lxviii Band i, Abtheil i and ii, Heft ii, Abtheil i and ii, Heft. Wien, 1873. 8vo. With plates.

Zeitschrift fur die gesammten Naturwissenschaften. By C. G. Giebel. Berlin, 1873. Neue Folge, Band vii with plates, pp. 522 and Band viii. pp. 582. 8vo.

Sitzungs berichte der Gesellschaft Naturforschender Freunde zu Berlin. Berlin, 1873, pp. 152. 8vo,

Bulletin Mensuel de la Societe d'Acclimatation. 3me Serie. Tome i, No. 3. Paris, 1874. pp. 161-256. 8vo.

Berliner Entomologische Zeitschrift. Jahrg. xvii (1873), 3-4. With plate. Jahrg. xviii (1874), 1-2. pp. 243-480, 3-240. 8vo.

On the Homologies and Origin of the Types of Molar Teeth of Mammalia Educabilia. By Edward D. Cope. Philadelphia, 1874. pp. 24. 8vo. With a plate.

Report on the Fossil Plants of the lower Carboniferous and Millstone Grit Formations of Canada. By J. W. Dawson. Montreal, 1873. pp. 47. 8vo. With plates.